THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVIII. No. 2424.] LONDON, OCTOBER 26, 1909. [61ST YEAR. PRICE 6d.

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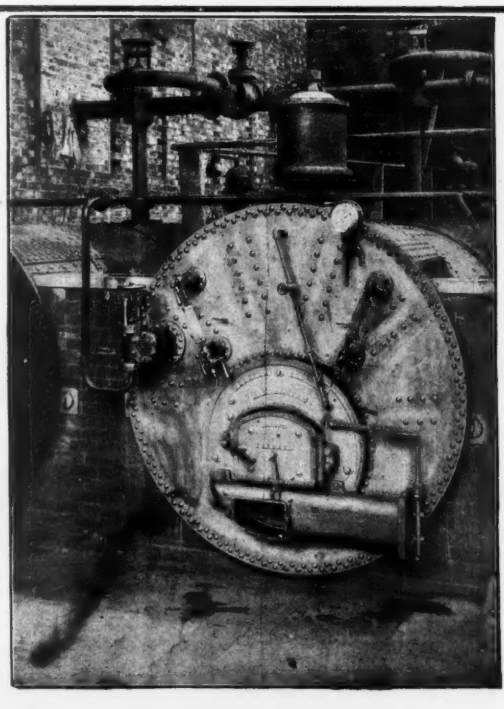

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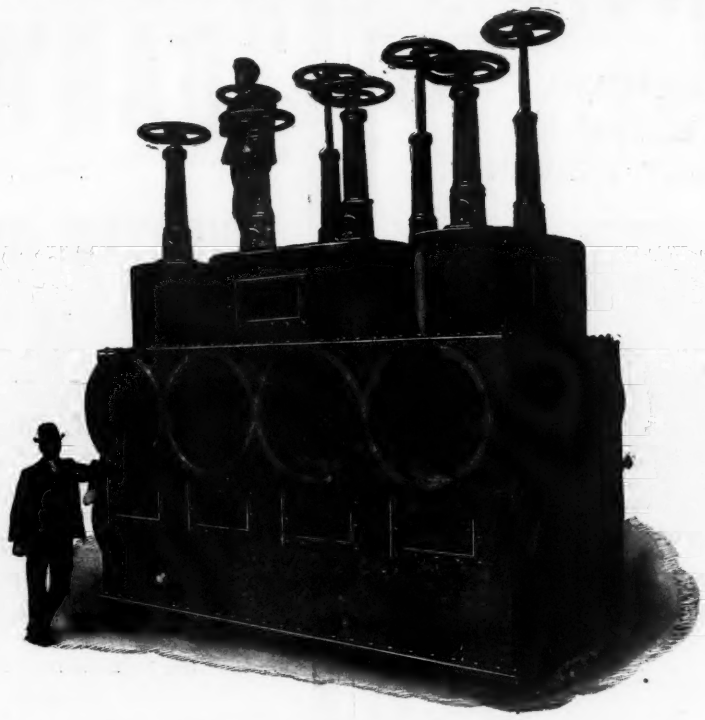

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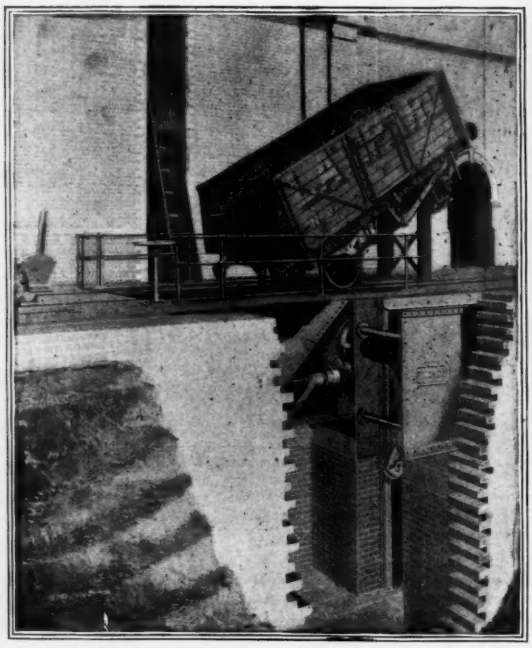

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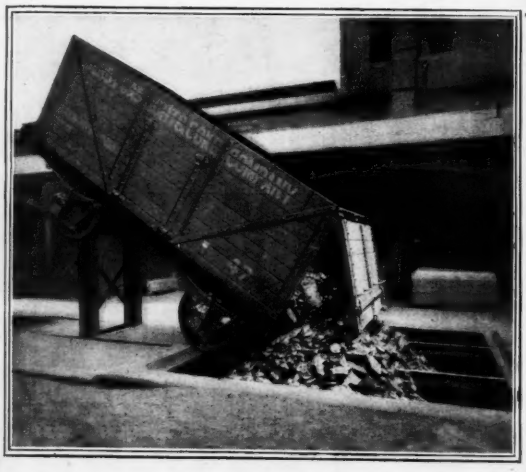

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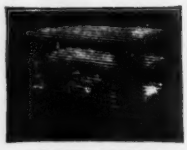

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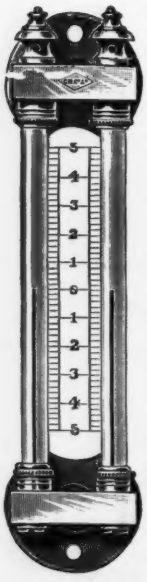

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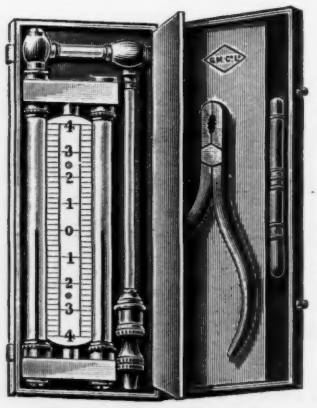

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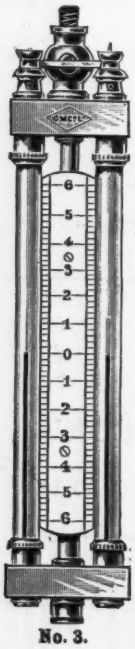

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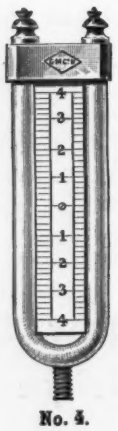

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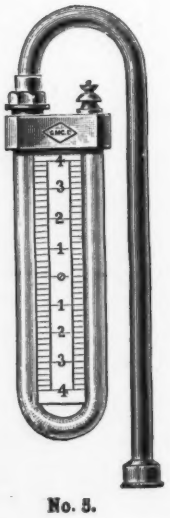

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110 Candles for less than **4 cubic feet of Gas** per hour.

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Specially suitable for **Lobbies, Open Shops, Arcades,** and **Verandahs.**

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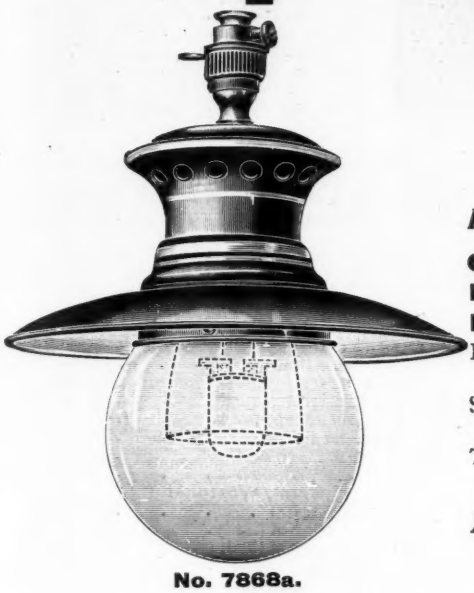

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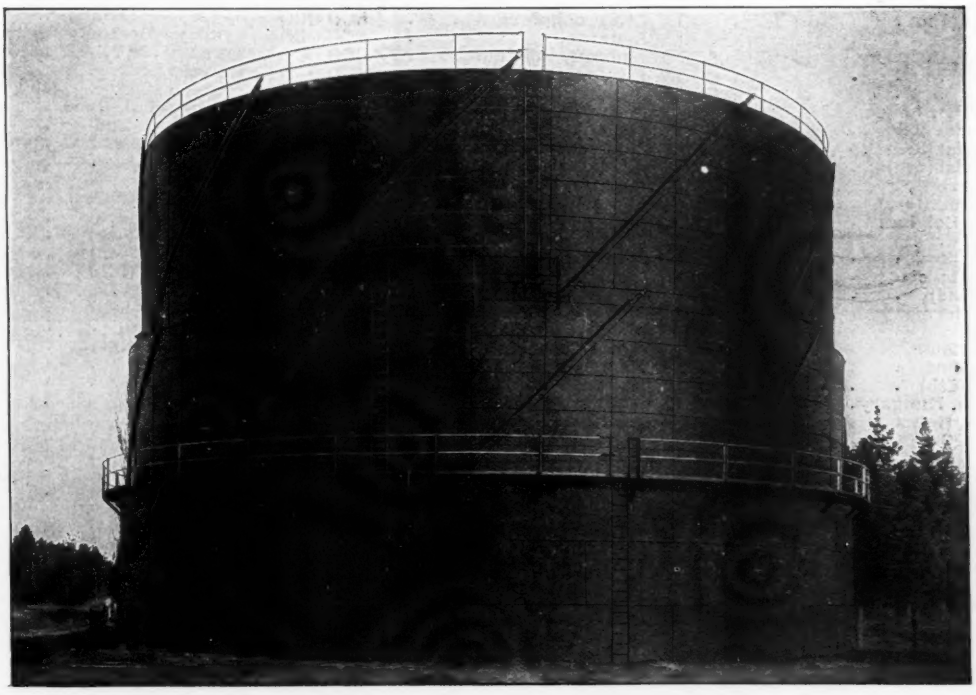

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Allenstein, Germany	200,000	Frankenthal, Germany	175,000	Posen, Germany	450,000
Antwerp, Belgium	1,500,000	G. L. & C. Co. Beckton	2,250,000	Posen (2nd)	700,000
Antwerp (2nd)	1,000,000	G. L. & C. Co., ,, (2nd)	10,750,000	Prague, Austria	140,000
Ashford	250,000	G. L. & C. Co., Bromley	3,750,000	Preston	1,400,000
Augsburg, Bavaria	425,000	G. L. & C. Co., Fulham	1,750,000	Reading	1,000,000
Aylesbury	150,000	G. L. & C. Co., ,, (2nd)	750,000	Redhill	275,000
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Bath	1,000,000	Gablonz, Austria	140,000	Reichenberg (2nd)	200,000
Belfast	1,700,000	Gelsenkirchen, Westphalia	175,000	Revel, Russia	350000
Belfast (2nd)	4,500,000	Gelsenkirchen (2nd)	350,000	Rhymney Valley	175,000
Benrath, Germany	125,000	Geneva, Switz.	500,000	Romford	300,000
Berlin—Charlottenburg	2,500,000	Gosport	200,000	Romford (2nd)	350,000
Berlin—Rixdorf	650,000	Göteborg, Sweden	300,000	Rotterdam, Holland	850,000
Berlin—Rixdorf (2nd)	700,000	Göteborg (2nd)	600,000	Rotterdam (2nd)	1,500,000
Berlin—Tegel	3,500,000	Graudenz, Prussia	200,000	Rotterdam (3rd)	750,000
Berlin—Tegel (2nd)	6,350,000	Guildford	350,000	Rotterdam (4th)	750,000
Bilston	375,000	Guildford (2nd)	200,000	Rotterdam (5th)	600,000
Birmingham	1,500,000	Haarlem, Holland	850,000	St. Albans	700,000
Bishop's Stortford	200,000	Hamburg, Germany	1,750,000	St. Gallen, Switz.	225,000
Bochum, Westphalia	530,000	Hampton Court	500,000	St. Gallen (2nd)	225,000
Bognor	100,000	Hampton Court (2nd)	600,000	St. Joseph, Mo.	750,000
Bordentown, N.J.	125,000	Hartlepool	750,000	San Paulo, Brazil	700,000
Bournemouth	1,000,000	Hebden Bridge	200,000	Santiago de Cuba	400,000
Bournemouth (2nd)	500,000	Heidelberg, Germany	200,000	Scarborough	800,000
Bremen, Germany	550,000	Holyoke, Mass.	600,000	Schwelm, Westphalia	100,000
Bremen (2nd)	950,000	Hong Kong	450,000	Shanghai	225,000
Bremen (3rd)	850,000	Hull	1,500,000	Shanghai (2nd)	225,000
Brentford	1,200,000	Ilford	650,000	Shanghai (3rd)	1,600,000
Brentford (2nd)	850,000	Innsbruck, Austria	200,000	Southampton	800,000
Bridgwater	200,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridlington	150,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington (2nd)	200,000	Kiel, Sleswig	1,000,000	Southgate	400,000
Brieg, Silesia	100,000	Kiel (2nd)	880,000	Southport	750,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	Southport (2nd)	900,000
Brighton (2nd)	1,850,000	Lausanne, Switz.	250,000	South Shields	650,000
Bromley	1,500,000	Lawrence, Mass.	400,000	Stafford	500,000
Bruges, Belgium	200,000	Lea Bridge	350,000	Staines	600,000
Brussels—Anderlecht	350,000	Lea Bridge (2nd)	350,000	Stettin, Germany	880,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (3rd)	400,000	Stockholm	1,500,000
Brussels—Forest	1,000,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
Brussels—Koekelberg	1,000,000	Leeuwarden, Holland	400,000	Stockport	600,000
Brussels—St. Gilles	1,000,000	Leiden, Holland	500,000	Stockport (2nd)	600,000
Brussels—St. Josse	1,000,000	Leiden (2nd)	575,000	Stockport (3rd)	400,000
Brussels—St. Josse (2nd)	600,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—Ville	750,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville (2nd)	750,000	Lemberg (2nd)	500,000	Swansea (2nd)	1,000,000
Brussels—Ville (3rd)	1,500,000	Liége, Belgium	1,000,000	Swansea (3rd)	450,000
Brussels—Ville (4th)	350,000	Liége (2nd)	750,000	Swindon	300,000
Bucarest, Roumania	1,100,000	Lincoln	500,000	Sydney—Harbour	500,000
Budapest, Hungary	50,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest (2nd)	1,750,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Carlisle	600,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlsruhe, Germany	500,000	Louvain, Belgium	800,000	Syracuse, N.Y.	850,000
Chigwell	350,000	Lübeck, Germany	400,000	Taunton	225,000
Chorley	300,000	Maastricht, Holland	200,000	Taunton (2nd)	350,000
Commercial, London	850,000	Magdeburg, Germany	1,400,000	The Hague Holland	1,000,000
Commercial (2nd)	850,000	Maidenhead	225,000	The Hague (2nd)	500,000
Commercial (3rd)	1,250,000	Maidenhead (2nd)	225,000	Tilburg, Holland	400,000
Commercial (4th)	2,000,000	Maidstone	500,000	Torquay	350,000
Copenhagen	700,000	Malines, Belgium	500,000	Tottenham	750,000
Copenhagen (2nd)	2,500,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
Courtrai, Belgium	250,000	Malta	400,000	Tottenham (3rd)	350,000
Coventry	600,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
Coventry (2nd)	600,000	Manchester (2nd)	3,500,000	Tottenham (5th)	1,000,000
Cracow, Galicia	200,000	Marlborough	100,000	Tottenham (6th)	1,250,000
Cracow (2nd)	200,000	Mayence, Germany	700,000	Tunbridge Wells	1,000,000
Crefeld, Germany	500,000	McKeesport, Pa.	500,000	Utrecht, Holland	1,000,000
Croydon	1,250,000	Merthyr Tydfil	300,000	Utrecht (2nd)	1,000,000
Croydon (2nd)	625,000	Middlesbrough	1,250,000	Verviers, Belgium	1,000,000
Croydon (3rd)	625,000	Namur, Belgium	175,000	Vienna	3,500,000
Croydon (4th)	550,000	Nelson	400,000	Vienna (2nd)	2,500,000
Debreczin, Hungary	100,000	Newburgh, N.Y.	600,000	Waltham	400,000
Deventer, Holland	150,000	New York	5,200,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	Nictheroy, Brazil	250,000	Watford	300,000
Dorking	150,000	North Middlesex	150,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex (2nd)	200,000	Wellington, N.Z.	350,000
Dublin (2nd)	2,000,000	North Middlesex (3rd)	75,000	West Bromwich	550,000
Dublin (3rd)	650,000	Norwich	1,000,000	West Ham	1,500,000
Dundee	1,500,000	Norwich (2nd)	300,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Norwich (3rd)	500,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Nottingham	1,000,000	Weston (2nd)	350,000
Durham	200,000	Nottingham (2nd)	1,000,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Nuneaton	125,000	Wiesbaden, Germany	850,000
Eastbourne	1,250,000	Oberhausen, Germany	175,000	Winchester	225,000
Edinburgh	2,000,000	Oldenburg, Germany	200,000	Winchester (2nd)	125,000
Epsom	225,000	Ostend, Belgium	100,000	Wolverhampton	1,500,000
Epsom (2nd)	300,000	Ostend (2nd)	200,000	Zwolle, Holland	200,000
Falmouth	150,000	Perth, W.A.	125,000	Zwolle (2nd)	200,000

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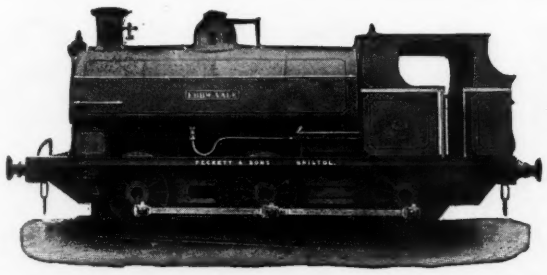

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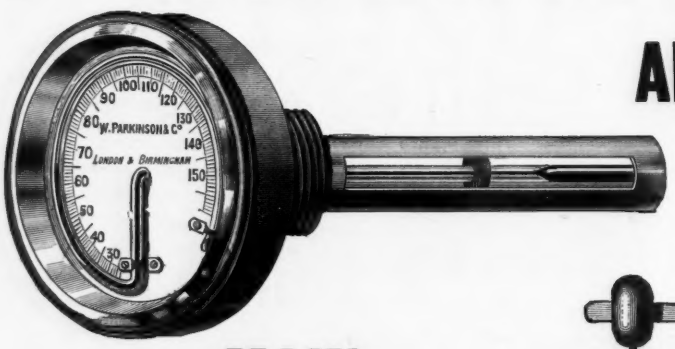

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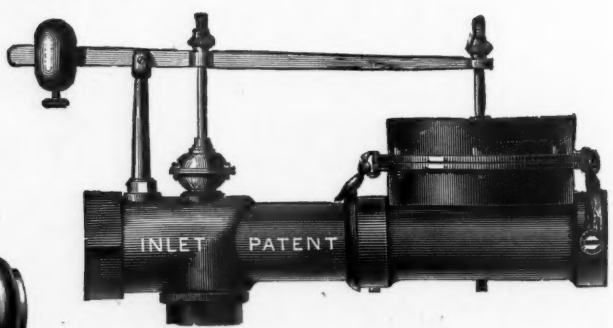

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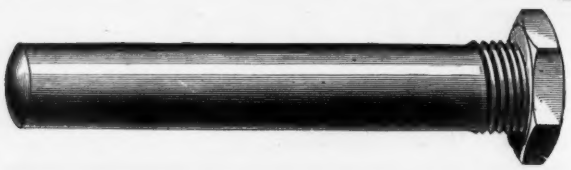

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVIII., No. 2424.—TUESDAY, OCTOBER 26, 1909.

EDITORIAL NOTES—GAS, &c.

Mr. Woodall on Technical Training.

UPON the words of no man in the industry would the juniors, or subordinates, in the professional ranks hang with more enthralled interest than upon those directly addressed to them by Mr. Corbet Woodall; for he occupies a place in the industry to which he has cut his way by the sheer and unaided force of personal qualities—intellectual and amiable. His opportunities have been won, not forced upon him, or provided by an indulgent influence; and those opportunities enable his survey—a survey that is as broad as it is long—of the world's gas industry to be classified among the unique. For all of which reasons, the members of the London and Southern Junior Association were honoured by the inauguration of their present session's work by an address from Mr. Woodall. The address was encouraging, was illuminating, was plenal with thought and suggestion, albeit in some parts reflecting a base of contention that has had existence in other minds in the perennial polemics provided by the application of higher technical education to the developing of the practices by which the destinies as well as the value to humanity of industries are, respectively, worked out and enhanced. Encouragement to the individual ran through the address, from the precursory parts to the final. If the principles of personal responsibility and usefulness in regard to the duties of an office, however subordinate, could be laid deeper in many an otherwise excellent nature, there would be the substratum of the foundation to individual ambition in the chosen vocation that would lead to greater things; and this was recognized in impressing the usefulness of position, however humble, in almost the first lines of the address. The men in whom these principles are laid the deepest are those who, by their attainments and successes, stand between the cuts of the whipcords of those who are ever lashing at the superior lines of technical education, and refusing to see but a limited, if any, compatibility between the higher intellectual and practical developments of the human mind. It is not only by failures but by successes that judgment must go. The very life of our industry in the lighting service has been saved by the fruits of the academical attainments of Bunsen and of Welsbach; and not a small part of our directive carbonizing knowledge of modern garnering has come from the application of science to practice. Practice without science is to-day in danger.

By no means does Mr. Woodall decry collegiate training and attainments in combination with the practical work of the gas industry. It is with him, care in reading indicates, altogether a matter of method in producing the combination; so that between him and those who claim the propriety of a greater infusion of higher technical education in industry, differences are only of degree. His interest in the matter is great. He feels, at the outset, disposed to call a plague on all the perpetual writings on the subject; and then himself proceeds to deliver his soul over several pages of manuscript. The expressions of inspective thought in the address are many; and one and all invite comment. But there must be limitation. Here is one outstanding remark: "All that "the best teaching arrangements can do for a man is to "put him in the way of teaching himself." What better can a man want? The routinist is developed, the ruts of the formalist get deeper and deeper, without the preparatory guiding knowledge suitable to the position to which a man is called. We do not like throwing a man into a works, and letting him there pick up what he can, without the knowledge that gives the power of analytical and critical discernment. The ways of the works may not be good; and the preparatory technical education will enable the beginner to exercise discrimination, to better understand whether or not particular shop or works practices are such as shall retain a place in his own future practice, to guard against falling into the ruts of routine, and at the same time will give his intuitive faculty fuller play. The higher the intellectual attainment (always supported and braced by practical experience) befitting the position and character of work, the less reliance has the individual to place on others; the lower the suitable intellectual attainment, the narrower the scope for effecting progress in the practical work. We cannot escape from this truth. If we attempt to do so, we commit ourselves to a negation of the force of intellectual qualities. From the aboriginal state to the state of the present, intellectual development has been at the very root of every fresh measure of progress. "Start," says Mr. Woodall, "cramming a young man upon some *a priori* assumption of "what he ought to be taught, and you run the risk of spoil-"ing a good worker, and make a poor intellectual." May we go farther down the address, and cull from it the words, "It all depends upon the quality of the individual mind," which, applied to the foregoing quotation, is another way of saying that it all depends upon the individual whether or not the submission of the cited sentence, and, in fact, the submissions of many other parts of this portion of the address, are reversible.

As we have said, though in places in the address it would almost seem, from the manner of expression, that Mr. Woodall thinks somewhat little of the higher grades of technical education in a man whose life is to be devoted to a practical and commercial industry, it is all a question of degree, and of the mode of acquisition of knowledge, both theoretical and practical. There is a touch of individuality about the observation, "Wherefore, I make no apology for "speaking to you of the need of the better education of gas "men from the practical, bread-and-butter point of view." Therein is represented the channel through which the whole of the thought courses that constitutes this the main section of the address. But Mr. Woodall would be the very first to regret if any part of the utterances bearing all the influencing authority of his name should be construed as meaning that he in any way sets small store on the highest intellectual attainment that has applicability to the walk in life that a man elects to pursue. Such construction is rebutted by many a sentence, and notably by the one: "I must "say I should like to see in young men aiming to qualify "as gas managers, superintendents, and for the higher "offices in the industry generally, a greater keenness for "technical study, and also a better appreciation of the busi-"ness side of technical matters." What he would like to see, in the training of young men aspiring to become the chief technical and executive officers of the industry, is an intermixing, through one period, of practical and scientific or technical (name it as you will) training such as obtains for naval officers—that is to say, some active division of work and study that would give a few months on the works, then a few months at special study, and so on in rotation, until in due season there is ripeness for the responsibilities of full office to be undertaken.

That is the ideal; but the feasibility would be restricted by personal and geographical circumstances, unless the industry sets about making needful provision for the most promising of its young men. But the gas industry is the most conservative and immovable of all industries of which we have knowledge in matters affecting the future. In the case of a big concern such as the Gaslight and Coke Company, which is a power unto itself in many matters, things are altogether different from those which obtain in the great majority of gas undertakings. Viewed from the standpoint of that Company, things may appear easy that are difficult and impossible to most other concerns. But consulting the highest interests of the gas industry, it would not do for the practical training of the prospective chief technical officers of the industry to be restricted to the big and most (from the business standpoint only) propitiously situated concerns. It would perhaps be quite easy for the Gaslight and Coke Company to carry this particular ideal into effect; it will be a transgression of administrative propriety if the Governor of the Company does not see what can be done in this direc-

tion. He has accomplished much, by the aid and countenance of his colleagues, in putting into practice the views expressed as to the interjunction of the acquisition of technical knowledge and of practical work by fitters in embryo and the artisans in the Company's service. Worthy of acceptance is that pattern of good deeds with lasting beneficial effects. But regarding the intermingling of higher scientific education with practical training for those qualifying for the chief technical offices, it is seen that after all, when thoroughly digested, it all merely amounts to this—that Mr. Woodall prefers one manner of proceeding; some other people prefer another. The end is the same.

Several other topics were touched upon in the address, all more or less scintillating with advice and wise reflection that should be kept ever present in memory. Mr. Woodall confessed that, in inditing the address, he had before him the hope that it might be encouraging, and be not unworthy of being remembered, "for," he reflectively remarked, "I "have now borne my own professional equipment for a very "long time, and shall have no further use for it when many "of you will be entering upon your prime." The words remind one of the flight of time; but the reminder is not pleasant. We do not wish to look forward to the day that will register the retirement of Mr. Woodall from the activities of the industry. As previously said, he has occupied, and occupies now, a unique position, and that an enviable one, carrying with it as it does a high place in the confidence of the industry. That place we do not desire to see vacated for many a long year.

Depreciation, Rating, and Competition.

THE papers presented to the members of the Midland Association, meeting on Thursday under the presidency of Mr. W. Langford, suggest upon their face that the Committee had some difficulty in obtaining technical contributions for the occasion. Therefore, all the more credit to those who came forward with topics for discussion. If distinction may be made, the principal paper, from the point of view of subject-matter, was one by Mr. George Helps, entitled "Notes on "Income-Tax and Assessments." It carried us once more within the bounds of the intricacies of, and controversies over, rating; contributing to the existing confused mass of individual opinions and personally evolved principles on the subject. There are so many authorities of more or less degree on rating, all with their own peculiar *penchant* in various directions, supplemented by statutes and case-law, that the layman, who is generally the victim of it all, is in a complete maze when he has cause to direct his interest to the matter. The recent action of the Board of Inland Revenue has revived in the gas industry interest in the question of the allowance for depreciation in respect of income-tax. Mr. Helps does not think the instructions of the Board to their Surveyors are as bad as they appear to some, and that they ought not to be construed to mean that the Board will not allow any depreciation. To our mind, the Board are rather definite in their instructions: "*No* depreciation "should be allowed *in any circumstances* in respect of any "portion of these undertakings." There is nothing at all doubtful there. But "repairs and renewals may be allowed "as working expenses as and when incurred. Excep- "tional expenditure on *bonâ fide* renewals, where the full "effect cannot be given in one year, may be carried "forward to the following year or years." It is quite clear from this that the Board regard repairs and renewals as one thing, and depreciation as another, and that they prefer the unstatesmanlike and unsound financial plan of mulcting the year in which renewals occur—be they large or small—with the expenditure, or, if exceptional, to form a suspense account, and wipe off the amount in subsequent years. This does not commend itself as such a rational plan of dealing with the matter as by providing for replacement during the useful life of the subject, and when it is yielding its share of service in providing profit. If Mr. Helps's reading of the instructions be correct—that the Board will make an allowance in respect of what is ordinarily understood as depreciation—we fail to see the object of the instructions; and we do not think such marching orders to the surveyors are issued for the mere sport of the thing by such a sedate body, and one always alert for the main chance, as the Board of Inland Revenue.

If Mr. Helps does not agree with the literal and generally accepted meaning of the instructions, then we cannot understand why he penned the sound statement that appears in the opening lines of his paper: "The one question in con- "nection with income-tax that affects all of us most is that "of depreciation. It must be very certain that everything "connected with gas-works depreciates, and that this depre- "ciation has to be made good before net profits can be "arrived at. If a gas-works be taxed on receipts, *plus* "depreciation, there is something wrong with the Act of "Parliament or the administration of it." We know that there is a good deal of depreciation going on all round that is not countervailed by charges for repairs and renewals; and that between the balance-sheet value of a concern and the current actual structural value, unless there be a covering allowance for depreciation, a fair level is not maintained. Administrations of company-owned undertakings are adjured by authorities to, on the one hand, pay greater attention to depreciation, so as to bring down the capital account as much as possible to a reasonable amount for conducting the business on the best competitive lines; while others, who no doubt place themselves on an equal level in the matter of authority, say you must not do this and you must not do that, and impose (as the Board of Inland Revenue have done) obstacles in the very ways to the more stable financial condition. There is indeed a largeness of inconsistency between authorities on the ethics of financial procedure, and generally on points of valuation. It is on the inconsistencies of the law, custom, and personal predilections and inventiveness that valuers live.

Among the many *dicta* of his paper, Mr. Helps (as already mentioned) says that "it must be *very certain* that *everything* "connected with a gas-works depreciates, and that this "depreciation has to be made good, or allowed for, before "net profits can be arrived at." "Everything" includes meters. But—we quote this as an illustration of inconsistency only, knowing that Mr. Helps is not alone in this particular matter, and that there is high authority in his support—he does not allow that there should be this depreciation when once meters are replaced out of revenue; but, in the case of new meters for new consumers that have been charged to capital, there should be an allowance. The submission is hardly logical. The original meters had to be paid for from capital; and whether meters are those originally capital-charged ones or their successors, depreciation continues in use, and the day of replacement is a certainty. It would be just as reasonable to argue that, meters having been replaced from revenue, their representation in the capital account has no further existence, and therefore that year by year rent ought not to be charged. No matter whether the meter in existence is one that has been provided from capital, or is a replacement the purchase price of which has been provided out of revenue, the Income-Tax Authorities should make an allowance for depreciation. If the validity of the author's contention is admitted in this one particular, then there is not the slightest reason why it should not be applied to all the other parts of the gas-works plant, and a beautiful tangle would ensue. The idea of the Inland Revenue Commissioners is to get their full pound of flesh as early as possible, and a bit more if they can by withdrawing depreciation allowances.

The Board of Inland Revenue "know," remarks the author, what gas-works have "done—gas-works which were "once new; and perhaps they think they are entitled to re- "ceive a little more than their due when they have such an "opportunity." There is in this an insinuation of corrupt financial practice on the part of gas-works. It is not the only place in the paper where there are objectionable statements—objectionable because unqualified, or insufficiently so. There are accusations as to badly-kept accounts, and of extravagance in charges to revenue account. There are no doubt instances of both. Immoral and almost criminal action is alleged against directors, through which they and their friends have financially benefited and the shareholders have suffered. These things, it would have been well to have pointed out in the paper, have been the exception rather than the rule, and that the general rule is to find that extravagant charging and illicit practices do not exist. Mr. Helps admits that he has been studying the matter of rating for some years past from the side of the taxing and rating authorities. We believe him, and that he has done so with his eyes partially closed to the other side. Having done this, he has come to "the conclusion that gas undertakings have no "reason to wish the law altered." On that current subject of depreciation and income-tax, too, the author was walking the whole time on the border-line of a declaration that he was completely in accord with the instructions of the Inland

Revenue Commissioners in regard to gas-works depreciation, notwithstanding that allowances are made in connection with electricity works. In the paper, there is not much guidance; and, generally speaking, the author's views will be found antagonistic to those prevailing in the industry's professional ranks.

The second paper read at the meeting was not of a pretentious character. It was by Mr. W. J. Rendell Baker, of Malvern; and it dealt with two of the competitors of town gas—carburetted air and electricity. In respect of both, though Mr. Baker occupies the dual position of Gas and Electricity Engineer, he was able to show that, in the matter of economy, town gas far and away takes the lead. Regarding air gas, no gas engineer, where there is a town-gas main delivering a supply at a reasonable price, would look upon its competition with any seriousness. It has a place, but it is not near a town-gas main, unless personal interest and influence come into the reckoning. The trouble of such plant, the question of closing-down at night time, the storage of the carburetting petrol, the capital expenditure, the maintenance, and the attention, are, with others, factors that operate against popularity. But, in the matter of cost, air gas cannot, all points being taken into consideration, compete with normal gas prices. The figure of 2s. 4d. per 1000 cubic feet for petrol only—representing 2 gallons—that Mr. Baker quotes in one part of his paper, must not be taken as being generally applicable. That is for a special form of apparatus to provide gas for use with ordinary incandescent gas-burners. He refers earlier in the paper to another form of plant in which 1250 cubic feet are obtained with a consumption of a gallon of spirit at 1s. 2d. That is about the general run of claim—some go higher—that the makers of air-gas plants put forward. But where they lose ground in comparison with coal gas is in the heaviness, for a given illuminating power, of the consumption of this attenuated gas of low thermal value. That is the rock on which is wrecked the *primâ facie* economy shown per 1000 cubic feet, to say nothing of capital and other costs.

Turning to the electricity side of the paper, gas and electricity being under one management, there is not the same competition in Malvern as there would be were the position otherwise. The one department supplies light, heat, and power by gas or electricity; and the consumer can exercise his own choice. There is decided public economy in the arrangement. But it was not a question of administration with which Mr. Baker treated, but the subject of the progress made in efficiency by the electric metallic filament lamp, and yet "a very wide margin" remains in favour of coal gas. The figures as to the tests that he has made with metallic filament lamps show in some instances that the claims of the more enthusiastic electricians are not always borne out by the result. Instead of efficiencies approximating 1 watt per candle, it is seen that there are such efficiencies as 1·7, 1·62, and 1·48 watts per candle. But we should rather like to know something more about the three lamps designated "C." It seems to us there is something wrong with the figures. If the wattage (41·3 and 28·3 respectively) is correct for the 50 and 32 candle power lamps, the efficiency is well under 1 watt per candle power. There is no acquaintance on our part with such metallic filament lamps. The idea that there is some error is rather supported by the 16-candle lamp in class "C" requiring 20·4 watts, or substantially the normal figure for metallic filament lamps. However, perhaps Mr. Baker will supplement his information on this point.

An Effete Bargain.

CONSIDERABLE reverence for parliamentary bargains is evinced by some people. Whether the bargain is worthy of the regard depends upon its character. In the ordinary application of the term, it connotes mutual consideration in some form or other. What the term implies, however, is not always existent in so-called parliamentary "bargains." It does not require much experience of Private Bill legislation to learn that such bargains are frequently one-sided, and are more often than not the result of reluctant concessions by promoters to escape from the penalties of opposition; for penalties obtain whether or not the opposition is successful, and one of the worst of the penalties is the invidiousness that in the case of the defeat of the opposition sometimes unhappily supervenes. Where a company is concerned—a gas company especially—the majority of local authorities regard it as something approaching a sacred duty to grind down its face on every available occasion, and to the utmost achievable extreme. It is very regrettable that it should be so; but the fact remains. The controlling effects of the sliding-scale, the limitations of funds, the new restriction as to the carry-forward—all of which keep companies within safe bounds in the relationship of their own interests with those of the consumers—have no effect in persuading the authorities that they can safely withhold their hand and hostility in several other matters that do not clash with the welfare of the body-politic. Few companies are given credit by local authorities for honesty of purpose when they approach Parliament, nor for a desire to serve their area to the best advantage, and share with the consumers the proceeds of prosperity. All that can be squeezed out of a company, or that can be gained by the subtleties of parliamentary counsel or the acuteness of witnesses, are therefore referred to as "bargains," and worthy objects of the esteem of all, other than of the victims. There are bargains, too, that were fair enough in their day, but which are now effete, and obstructive to the best service.

There has been much talk, and much talk there probably will still be, in connection with the reduction of illuminating power and the adoption of the "Metropolitan" No. 2 test-burner, as to bargains regarding illuminating power and standard prices. While there is idle contention on the one side regarding these, scientists are trying to make the point clear that the constituents of gas from which the highest direct luminosity is obtained are not the best ones in the interests of calorific power, and that work should be directed to securing the largest percentage of the latter, and therefore the largest quantity of gas from a ton of coal that will give the maximum number of heat units. That is the direction in which work must proceed to give the cheapest gas of the quality necessary for current uses. The incandescent burner, the cooker, the heater, the gas-engine—severally and collectively—demand not sperm value but calorific value. All the day gas that has made such a vast difference to the stability of the industry requires the latter. And yet there is haggling over a so-called "bargain" that is no longer a credible one, that no longer finds support for its continuance, nor justification for the descriptive name of "bargain" that its godfathers—quite correctly perhaps at the time—gave it, but which is now a misnomer by the complete lapse in value of one of the conditions. The authorities who were one of the parties to this particular bargain were only so by virtue of their elective office; they were merely the representatives of the consumers. But the time has come when, by these representatives clinging to the letter of the bargain, the interests of the consumers of gas are not best served. The bargain enforces something that the consumers of the greatest proportion of the gas output do not want, and that enforcement retards the supply at the cheapest possible rate of the heat units that they do want. It is a case of an obsolete condition dragging vigorously at the heels of scientific progress.

And, what is more, these ill-advised representatives of the consumers, these representatives who have no scientific or practical understanding of the position, these representatives who would perpetuate a condition that is as useless as it is obstructive, claim that this useless and obstructive condition as to illuminating power should be made, on the reduction of the standard quality, and the introduction of the "Metropolitan" No. 2 burner, the basis of a revision of the opposite condition in the "bargain"—that is to say, the standard price. The absurdity of this is only pardonable where there is ignorance. Beyond the considerations already advanced are others. There is not a gas-works-owning local council who has been in Parliament this session for additional gas powers who (not already having the authority) has not—and very properly—asked for a reduction of the illuminating power of gas to 14 candles, tested by the "Metropoli-"tan" No. 2 burner, and one of them is down to 12 candles! But where is there any effective bargain in this connection established between them and the consumers? Where is there any assurance that the consumer will obtain any monetary benefit from the change? There is not any assurance, and there has never been any in the case of municipal supply, such as the sliding-scale gives in the case of companies. Any saving that accrues may be devoted, solely on the volition of the local authority, to relief of the rates, including relief of the rates of those who are not gas consumers, but whose lighting is either by electricity or oil. But let the applicants for a reduction of illuminating power and the use of the "Metropolitan" No. 2 test-burner be a sliding-scale

company—under which scale the consumer is abundantly protected—the "bargain" is dragged forward, and paraded before Parliamentary Committees, as something that is really sacrosanct, though its main condition, which once invested it with credit and justice, has been degraded by changed circumstances. It is not the consumer under the sliding-scale company who needs protection. Subject to the prevailing market conditions for raw material and bye-products, he will get the fullest value in heat units for his money, before the shareholders can participate in any financial benefit; whereas those consumers who are under municipal supply conditions can only receive protection by a strict limitation of the profits that can be diverted to purposes other than the legitimate capital and general demands of the undertaking. While gas-owning local authorities come to Parliament—and, we repeat, very properly, too—for the reduction of illuminating power and the use of the "Metropolitan" No. 2 burner, while there is no corresponding "bargain" in connection with municipal gas and electricity supply to that which there is an attempt by local authorities to perpetuate in the case of sliding-scale gas companies, the case for perpetuation and revision, apart from the considerations advanced earlier in this article, is a peculiarly unsound one. For these and other reasons, the Joint Bill (to be promoted under the ægis of the Gas Companies' Protection Association) for the adoption, by all the companies desiring the change at present, of the "Metropolitan" No. 2 test-burner, should be allowed to go through without opposition. Parliament has given such a very clear indication of its views in this matter by, session after session, applying the modern illuminating power and test conditions, that hostility from any quarter would, in our opinion, be sheer folly.

A New Gas-Works, and Liverpool Policy.

A FEW points of interest are raised by the opening of the new gas-works that the Liverpool Corporation have constructed for the supply of Fazakerley, which suburb was annexed by the city towards the end of 1905. As all in the gas industry know, the city is supplied with gas by a Company, and the Corporation themselves are the electricity authority. This latter circumstance, however, does not weigh with the Corporation in dealing with the lighting of the streets of the city, as the relative extent of the applications of gas and electricity abundantly demonstrates. The same certificate to an independence of consideration and act as between the interests of the ratepayers and those of a municipally owned trading enterprise, could not be given to many towns. To that independence the new gas-works at Fazakerley are a further testimony; and what is more, in view of electricity ownership, they are a testimony to the indispensability of gas. Prior to the Corporation taking over the district, it appears to have been totally fallow ground so far as gas supply is concerned; and all the available evidence seems to lead to the conclusion that there ought to have been a union of Fazakerley to the Liverpool Gas Company's district before it was brought under the jurisdiction of the Corporation. The Company obviously had mains not far distant, for they have been supplying the Corporation with gas in bulk for the district during the construction of the Fazakerley works. There were negotiations, too, between the Corporation and the Company, in an endeavour to effect terms for a permanent supply for the area, in lieu of carrying out a scheme of new works. But the works opened last Thursday are a monument to the failure of the negotiations, and, *primâ facie*, a confession of an inability to deliver gas in bulk by a great Company on terms that would have rendered a comparatively small isolated plant an economic offence. There may be an explanation which is not before us. But it does cut against the grain to see a Gas Company's pipes on the borders of an area, and yet learn that it is considered possible to make a better showing by independent works.

There is one point that will operate strongly in favour of the new gas-works at Fazakerley, and that is the low capital expenditure at which Mr. Isaac Carr, M.Inst.C.E., the Consulting Engineer in this matter to the Corporation, has, despite a 15 feet depth of quicksand, put down the works. It makes one smile hugely at the enormous capitals proposed, and sometimes obtained, by the professional gas company promoter who trades on public ignorance, when one sees what can actually be done by an Engineer with a reputation as an economical designer and constructor to defend. Here are these new gas-works at Fazakerley, with a carbonizing capacity of 35 millions per annum, and all the other plant equal to 60 millions, with a present capital expenditure of only £12,710—quicksand notwithstanding. Everything in the works is good and sound, and of approved type; and all possible steps have been taken to ensure low working costs. But we think it a mistake—Mr. Carr is of contrary opinion—that the Corporation should be setting out to match from these works the character of gas supplied by the Liverpool Gas Company—that is to say, a 20-candle power gas, tested by the No. 7 standard flat-flame burner. Still the selling price will be but slightly in excess of that which is now being charged in the city by the Company. When the Corporation were applying to the Local Government Board for the Provisional Order to enable them to supply gas, the Board suggested the ordinary 14-candle standard tested by the "Metropolitan" No. 2 burner. True to his colours, Mr. Carr resisted this, and had the Liverpool standard established for Fazakerley. The only remark that need be made on this point is that it is difficult to understand anyone deliberately putting a restraint upon liberty in this way. Although the standard in a Provisional Order or Act is the commonly accepted one, there is no limit placed on the point to which the illuminating power may ascend above this. While speaking of the high illuminating power gas supplied in Liverpool, it is worthy of passing note that there are apparently rival claimants now to the questionable credit for the continuance of the super-quality. It has always been understood that the Company were jealous of the maintenance of the illuminating power in this age of a complete transformation in the methods of utilizing gas. But readers may be left to make what they can of these not too clearly reported remarks by Sir Charles Petrie (the Chairman of the Liverpool Tramways, Electric Power, and Lighting Committee), who presided at the ceremony inaugurating the Fazakerley Gas-Works: The Company "had always said if the Corporation "would allow them to reduce the candle power, they could "lower the price; but the terms were such they [? Company "or Corporation] could not think of making the alteration." Now there is confusion as to whether it is the Company or the Corporation who constitute the stumbling-block in the way of reform.

British v. German Retorts.

The letter from Mr. Charles Carpenter in our issue last week, announcing that an order for the retorts which will be required next year for renewals at two of the works of the South Metropolitan Gas Company had gone to Germany was received just before the "JOURNAL" was going to press, so that comment on it had to be deferred. The letter contains a warning that should be taken very seriously by British manufacturers of the refractory materials required by gas-works. The warning is all the more emphatic in view of the amount and character of the endorsement that it receives. Not only did the recommendations come from the respective Engineers of the two works, but they received the backing of the Chief Engineer (Mr. W. Doig Gibb) in seeking the approval of the Board, over which Mr. Charles Carpenter presides, and upon which is that veteran Engineer, Mr. Robert Morton. There is a weight of authority there that cannot be lightly disposed of by the British manufacturers. We are not by any means inclined to agree that a universal condemnation of the British produce is deserved; but there is admittedly all too much indifferent material about. But a salutary method of dealing with this is for gas engineers to promptly return all goods that are not up to specification. However, there is no other purpose but that of serving the interests of the manufacturers that has induced Mr. Carpenter to make his announcement. For the British manufacturers, the position is one of gravity; and it is for them immediately to stem the damage they will unquestionably sustain if they delay. The right way is to assure, and to prove beyond shadow of doubt, that their products are, and henceforth will be, superior to those of German origin. It is not, or should not be, a question of price. In the material employed in retort-settings, subject as it is to the wear and tear of fierce heating, and the stresses occasioned by intermittent charging and the ever-changing conditions within the retorts, quality is of greater consideration than price. Though the retorts and other refractory material may initially cost more, the durability—the saving in repair and maintenance, and the longer working period obtained—makes a somewhat heavier first cost than for less durable material a

profitable expenditure. It is from this point of view, it is because the duty of Board and Engineers is first to the Company they serve, it is because their particular experience confirms their action, that these retort orders have gone to Germany; and Mr. Carpenter makes it clear that it rests entirely with the British manufacturers whether the orders in future stay at home or again go to the Continent.

Not a Modern Experience.

This is not a new matter for the gas industry, nor for the South Metropolitan Gas Company. It has been having consideration for years. Long before the famous paper (in 1908) by Mr. F. J. Bywater before the Institution of Gas Engineers, there were trials made with German retorts in a works under our immediate observation; and the results were at that time excellent. But, rightly or wrongly, "Patriotism" was allowed in that instance to stand before "Profit." As to the South Metropolitan Gas Company, let us recall Mr. Carpenter's own words in the discussion on Mr. Bywater's paper last June twelvemonth:

> He wished emphatically to corroborate the author in what he had said with regard to the German manufacturer. He was to-day the best manufacturer of fire-clay goods. If one wanted the best, one must get them from Germany. Germany had built up this industry, as it had many others, by technical knowledge and education; and unless they in England set their house in order, and conducted their industries in the same way, they would not only not regain the ground they had lost, but would lose still more. He spoke from experience in this respect; and no doubt the author had done so also.

What has been done since Mr. Bywater's paper threw the makers of refractory materials into some consternation through the direct attack upon their reputation and methods? They have been slow to work with deliberation to rehabilitate the confidence of purchasers that was then rudely shaken. It is true the English Ceramic Society have made a move; and that Sub-Committees have been appointed in connection with various industries using refractory materials to consider the questions of standardizing and improvement. There is a Sub-Committee of the Institution of Gas Engineers; and their report concerning the questions they have under consideration appeared in our issue for June 1 last (p. 575). But this is not sufficient. The manufacturers themselves must set to work, and that without delay, to wipe out the bad impression created, to which fresh life has been given by Mr. Carpenter's letter. There must be introspection and action. The real work must be done within their own factories; and they must not keep dark what they have done and are doing. The circumstances are such that the best course is to come out as much as possible into the open, and show that their methods are not rigidly confined to rule-of-thumb and tradition, and that they are (to quote Mr. Carpenter) using brains in the compounding of their retorts and other materials. If the manufacturers sit quietly under this renewed charge of incapacity compared with the German manufacturer, we shall be greatly mistaken in them.

In a Tight Corner.

Edmund Eaton and his coadjutors in company promotion have their dupes hotly pressing them; but outwardly they appear to maintain under the circumstances the same *sang-froid* that characterized them when they were at work imposing their money-making schemes upon the public. Receivers have been appointed in connection with two more of the precious brood of grossly over-capitalized concerns—the Ticehurst and the New Toddington; but the receivers will find the assets are of small value in contrast with the capital and debenture issues. Meanwhile, Mr C. S. Glover is prosecuting his campaign on behalf of the shareholders of the Ticehurst Company; but he cannot get very far through the Directors continuing their old policy of declining to see shareholders and refusing them information. He has been to Ticehurst and Wadhurst and inspected the works of the Company. His description is summed up in the word "primitive;" his estimate of value, from observation and local inquiry, is placed at, as an outside figure, £5000, though £67,000 in debentures and shares has gone somewhere. The Company are in the possession of two gasholders—one of 10,000 cubic feet capacity and the other about 5000 cubic feet, together about large enough to accommodate the gas from a little more than a ton of coal! If this is not a clear case of something to which a very harsh name could be properly applied, then we do not know the true meaning of the term in mind. An advertisement has appeared calling an ordinary meeting of the Company for to-day to receive the long-deferred report and accounts, and for other general business. The combined action of the shareholders has evidently assisted to put the Board in motion to discount some of their administrative delinquencies. But, up to the date of Mr. Glover's last circular to the shareholders (Oct. 20), he had not personally received any notice of the meeting, nor a copy of the report or accounts. From further information given by him, he had the doubtful pleasure of meeting Eaton on the occasion of his visit to the Ticehurst works, the plant at which the Company promoter appears to be using for some experimental work in connection with another of his launchings—the Patent Block Tar, Motor Oil and Asphalte Company, a revived venture whose second prospectus was noticed in our columns not long since.

An Internal Combustion Water-Pump.

Those of our readers who attended the Engineering Conference, organized by the Institution of Civil Engineers, in the summer of 1907, may remember that in the course of the discussion on a paper that was submitted by Messrs. Hawksley and Davey, on "The Cost of Pumping by Various Methods," attention was called by Mr. H. A. Humphrey to the low mechanical efficiency—56 per cent.—given for a combined gas-engine and pump, which he considered allowed great room for improvement. He related how, when he was associated with the late Sir Frederick Bramwell, the latter suggested that there ought to be a better means of utilizing gas for pumping, and one that would give a higher efficiency. Mr. Humphrey was asked to think the matter over, and he did so; the result being the designing of the pump described and illustrated in another part of the "JOURNAL." It will be noticed that it has no piston, fly-wheel, crank-shaft, or any of the customary appurtenances of a water-pump. The explosion takes place immediately in contact with the water; and on the occasion above referred to Mr. Hawksley asked whether the pump could be used with water intended for consumption. Mr. Humphrey replied that it could, as the gas need not come in contact with that which was actually delivered.

Socialism in Practice.

A very good object-lesson in practical Socialism is afforded by an experiment in France which has ended in disastrous failure, and the story of which is told by the British Consul at Lyons in a recently-issued report. In 1891, he says, the ill-starred venture was commenced, in the shape of the "Miners' Mine" in the Loire coal-basin; and it was heralded as marking the inauguration of a new golden age of industrial co-operation. A concession consisting of four pits, covering an area of 183 acres, was obtained at a low price; and subscriptions flowed in from all quarters. The essential point about the undertaking was that all profits were to be divided among workers in the mine. It appears, however, that dissensions and difficulties soon made their appearance, never again to depart until the final closing down of the pits in the autumn of 1908. The chief of these disputes arose from the fact that, soon after the opening of the mine, the regular members of the society began to get in outside men to help. These auxiliaries gradually grew to consider themselves just as much shareholders as the original members, and therefore equally entitled to share in the profits. Moreover, it not infrequently happened that when funds were low an all-round *pro rata* reduction had to be made in wages—an arrangement which caused great dissatisfaction among many of the men, who, being unable apparently to grasp the principles of co-operation, demanded their full wage. What they apparently failed altogether to see, states the Consul, was that the principle of co-operation involved their taking the rough times with the smooth. This trouble marked the beginning of the end. Quarrels followed thick and fast. Chairman after chairman was elected, only to be intrigued against and forced to resign; the year 1905 witnessing the election and deposition of no less than five. Serious fires in two of the pits contributed to hasten the inevitable crisis; and the hard times that followed—in which the whole of the Loire basin suffered—found the "Miners' Mine" least of all able to make head against the storm. Money began to run short, creditors became pressing, and at length a Receiver was put in and the pits closed down. This plain unvarnished tale will do little to help the cause of Socialism among those who are able to regard the matter from a practical business point of view.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 267.)

ALL markets on the Stock Exchange without any exception were depressed last week, dominated by the continuous hardening of money. Even one or two which had stood out with hardened hearts had to give way at last. And, with the disagreeable prospect of the not distant settlement, realization and account-closing was the programme, and prices gave way accordingly. Things looked ominous from the very start. Gilt-edged were weak, and Consols dropped materially, although they closed only ⅛ worse. Rails were rather steadier; but the rest were dull or uneven. The general outlook was as bad on Tuesday. Consols fell ⅛. All leading departments were dull; and the bullish speculative lines became shaky. The gloom was, if anything, rather intensified on Wednesday, and not a ray of light was perceptible in any quarter. Consols went down another $\frac{5}{16}$. On Thursday, Consols were done more than once at 82 $\frac{1}{16}$ (the lowest price touched for many a long day); and everything was crushed by the monetary squeeze, which now culminated in a rise of the Bank rate to 5 per cent. On Friday, depression ruled everywhere, especially in the more speculative quarters; but the gilt-edged were a bit steadier. Saturday was just the same, with marked weakness in Americans and South Africans, and prices closed much depressed. In the Money Market, there was a steady tightening day by day. On Thursday, the Bank rate was raised to 5 per cent.—a rate not attained in the last year and three-quarters. Before the close, rates were disposed to be easier. Business in the Gas Market was well up to the mark in point of volume, and was more liberally distributed than usual; some rarely-dealt-in issues providing a fair share of transactions. But, owing perhaps in a measure to the generally prevailing heaviness, the tendency was scarcely so strong. In Gaslight and Coke issues, the ordinary opened at 106¾; but it gave way towards the close, and was done once or twice at 105—a fall of 1. In the secured issues, the maximum marked 88⅞, the preference from 104¼ to 105 (a rise of ⅛), and the debenture from 85¼ to 86¼. South Metropolitan marked 121¼ on Tuesday, but was done at 120 free on Saturday. Commercials were very firm; the 4 per cent. realizing 110⅞ and 111, and the 3½ per cent. 104 and 104½. Among the Suburban and Provincial group, Alliance new changed hands at 17¾, Bournemouth B at 16½, ditto preference at 15 $\frac{7}{16}$ and 15 $\frac{9}{16}$, Brentford old at 256 (a rise of 1), ditto new at 191½, British at from 42¼ to 42½, Portsea "B" at 130½ and 130¾, ditto "D" at 101¾ and 102⅛, West Ham at from 124½ to 125½. In the Continental companies, Imperial made from 180½ to 181¾, Union 97½ and 98 (a rise of 1), European 24¾ and 25, ditto part-paid 18⅞, and Malta 5 $\frac{1}{16}$ and 5⅛. Among the undertakings of the remoter world, Bombay old changed hands at 6½, ditto new at 4¾, Buenos Ayres at from 13⅝ to 13 $\frac{13}{16}$, Cape Town preference at 5 $\frac{5}{16}$, Oriental at from 140 to 141, Primitiva at 7¼, River Plate at 16½ and 16⅝, and ditto debenture at 96¾.

ELECTRICITY SUPPLY MEMORANDA.

Raison d'Etre—Old Stories Set in New Verbiage—Clutching at Straws—On Costs—The "Electrician" on Lighting Competition.

ELECTRICAL station engineers are a sleepy-headed lot if the authority of the "Electrical Times" may be accepted as trustworthy. We have had an opportunity since last Tuesday of reading a little more industriously than time would previously permit the domestic electrification issue of our contemporary, and have concluded it with our former conviction strengthened that there is great poverty of suitable appliances for general domestic electrification, that domestic electrification is not conducive to domestic economy, and that the case presented in favour is particularly thin. In the early part of the special number, there is the evidence of the light esteem in which our contemporary holds the commercial abilities of the central station engineer and their methods and degree of enthusiasm in applying them. The "immediate object," says our contemporary, "in issuing this special number is to arouse electric supply undertakers and installation contractors throughout the land to make the most of the immense opportunities—not yet generally realized—which domestic electrification affords them." In order to emphasize the estimate there is in these words as to the doltish attitude of the administrators of the electricity industry, and their failure to properly appreciate their position, it is further written: "We believe that as regards competition with gas for domestic use, the economical position of electricity has improved to an extent that is not fully recognized even by the electrical industry." Our friends of the electrical industry now know the full measure of their perceptive talents, and of their capacity for putting to the most effective use what they do perceive in the matter of electrical progress. The electrical industry should erect a monument to the "Electrical Times" for the unselfish interest exhibited from time to time in offering stimulant to the commercial workers, though the fortunes of the industry do not disclose any great effect from the lavish and highly flavoured doses that are served out. In the introductory notes to the issue, there is much said about what "we" have done. It was this contemporary that, on the arrival of the first practicable metallic filament lamp, made an attack on the cheap wiring problem. That was in 1902. This is 1909. What progress has been made in the Septennium? Very little; and the novelty of the metallic filament lamp has rapidly worn off. But it is not only to lighting, but to other matters that this domestic electrification number is dedicated. "The object is to hand our readers, a compendium of all the methods"—legitimate and otherwise—"available for the capture of the household consumer. Be he big fish or little, whether he is forced to wire cheaply or at ordinary prices, here is the array of implements for luring and landing him." "Luring him!" That is a good and exquisitely appropriate expression. There has been so much allurement in the past to get hold of the custom of householders and disappointment in the result, that the difficulty of the present is immeasurably increased. Householders know the bait, and the hook by which it is suspended.

In the other parts of the domestic electrification issue, there is much trivial talk—much in the husk line, but little in wheat. The writings in this "special" and everyday experiences when compared supply a mass of striking contradictions. The preparation of the number, and the character of the material of which it is largely composed, show, as pointedly as anything can do, the hard task that is being experienced in scraping in business under the favourable conditions that the "Electrical Times" fancy it has been the means of discovering, but which the central station engineer, hard pressed as he is for new domestic business, has not by the most microscopic examination succeeded in discovering. But this is an age of discovery more or less useful to the world, of the recognition of heroes, and of the conferment of gold medals, diplomas, and so forth. The "Electrical Times" (as already suggested) should not be overlooked in this distribution of honours, if the electrical industry thinks the discoveries worthy of recognition and reward. Among the discoveries are testimonials (only one of which is signed) from electricity consumers, stating that electricity *is* cheaper than gas. There are comparisons between gas and electricity, displaying savings by using the latter. But, alas! most central station engineers know that, did they so desire, gas suppliers could collect bushels of similar testimonials and comparisons, disclosing in terms which electrical chicanery could not subvert, that there is a material and not a mere hypothetical economy in employing the modern incandescent gas-lamps as compared with metallic filament lamps.

This is the reason why in "Publicity Powder and Shot," our contemporary finds it necessary to write: "The tradition that gas is cheaper than the electric light dies hard." Cheapness is not only a tradition, but a proved fact; and substantial facts of the kind are somewhat hard to kill. As might be expected, the old allegation peeps out again, that gas computations are only made on theoretical and laboratory conditions. Our contemporary wants its readers to sink intelligence, and to accept the doctrine as to the impossibility of reproducing, with such a simple uncomplicated instrument as the incandescent gas-burner, the theoretical measure and laboratory experience in the matter of efficiency. The absurdity of our contemporary's contention will be apparent to the meanest mental capacity; but there is no restraining the hard-pressed electrician in his descent to the frivolous and the mean, and to the depravity of absolute dishonesty, to serve his purpose. Quotation is made of the celebrated Westminster tests by Mr. Lancelot W. Wild, in which this gentleman constituted himself the judge of what the millions of gas consumers in this country do; and, instead of using incandescent gas-burners in a manner that would give them their most effective duty, he restricted their use to what he, with his narrow experience, believed to be the popular method of application. Against this there was protest at the time in these columns; and Mr. Wild's reply is on record for the perusal of all who choose to read it. Of course, in the eyes of electricians, no one among the 6 million or so consumers of gas supplied by statutory gas undertakings in this country (to say nothing of those served by non-statutory concerns) have had any practical experience of the cost of modern gas-lights, but only of theoretical and laboratory computations. What is more gas for lighting is now "staggering on four legs, not one of which is sound." The electrical industry must wish it was staggering the same way. The claims of gas for health, cleanliness, and so forth, it is said, laugh themselves out of court. We have heard something of the same sort before, and have read of it in the electrical press or central station literature. However, not over much is made of that point now. The electrical people have made themselves the laughing-stock of experienced gas consumers over the point; and, although directly challenged, electricians have declined to fix themselves down to any description of the "noxious" and "poisonous" fumes of which they speak so glibly in their literature.

But we get back on to price. "The public," we are told, "are beginning to find out the contemporary truth about cheapness." "Here and there, they get the enthusiastic testimony of neighbours who have tried the wire lamp, and the leaven is working in the lamp." In view of this, the gratuitous paternal advice to station engineers on the part of the "Electrical Times" appears to be somewhat superfluous; and the reasons adduced for the publication of this domestic electrification number are clearly without solid foundation. There is another side to the leaven working in the lump; and that is the common tale of the lighting units sold by the central station also dropping off in huge lumps. Having regard to the contradiction of facts and words, there is obviously something radically wrong with the arguments and statements of our contemporary; and the experienced electrical

canvasser, in his efforts to capture the domestic consumer, will feel that he requires in his work something more than this liberal supply of froth in the form of misrepresentation and frivolity. We will give our contemporary its due. It does show that where electricity beats gas for lighting, there has been a lavish and wasteful use of gas, by keeping it burning extravagantly in unnecessary positions. The same applies to electricity. The very facility, too, of switching on (switches are also getting common enough with gas lighting), and the neglect to switch off, is accountable for electricity bills being heavier than they would otherwise be in not a few cases. It is a case of familiarity breeding contempt, until the temporary check of the quarterly account comes into force, and even then the householder cannot always be on guard to regulate use.

A great point is made of the flash-jet sometimes (not commonly) used with incandescent burners. The straws at which the electricians clutch with avidity to assist their case are highly edifying, not to say amusing; and it is the best testimony to their nerveless case. Inverted burners from which the highest illuminating efficiency with gas is obtained, are not fitted with flash-jets unless ordered. With these, a light of 20 to 25 candles per cubic foot can be obtained, under ordinary conditions, which means that (at least) 20-candle light can be enjoyed for 2000 hours for an expenditure of 2000 cubic feet of gas; whereas a 16-Hefner unit (14½-candle) metallic filament lamp in the 2000 hours will use 40 units of electricity! Between the cost of the one and the cost of the other, there is a very big margin for lavish illumination with gas. We find that Mr. H. H. Holmes, formerly of West Ham now of Marylebone, has come to the front again in this domestic electrification issue, and is giving hints on how to develop the private house demand. We once put a question to Mr. Holmes which he has never answered. We put it now to the "Electrical Times," and if the answer is not in the affirmative or is in any way equivocal, we will invite our contemporary to put the matter to a photometrical test. Our question is, Are we correct in stating that it is *impossible* to get more, from a unit of electricity, with the metallic filament lamp than 800 candle-hours; and that it is *possible* to get, with an ordinary commercial inverted gas-burner (using gas at, say, 2s. 6d. per 1000 cubic feet), from 3d. spent in gas 1980 candle-hours, from 4d. 2640 candle-hours, from 5d. 3300 candle-hours, and from 6d. 3960 candle-hours—the 3d. to 6d. representing prices per unit? The whole of the fulminations of the "Electrical Times," and of Mr. Holmes, cannot dispose of these figures. They are reproducible under like conditions in practice just as easily as they are to be produced in the photometrical room. It will be seen that between the 800 candle-hours, and the figures given for gas, there is a thick and spacious covering for the multitude of sins attributed by our contemporary to gas and gas people. The gas companies publish figures, says Mr. Holmes, which they by no means obtain in practice. That is an old postulation of this gentleman; but he has never had the courage to toe the line in an attempt to prove it or to admit his error. We admit a point made by our contemporary, that there are a number of cheap and inefficient inverted gas-burners on the market; it is likewise true that there are a great number of cheap and inefficient metallic filament electric lamps on the market. But neither gas nor electricity consumers are compelled to buy one or the other.

The "Electrician" specially devoted some of its columns to the question of lighting the same week as the domestic electrification number of its contemporary appeared; and, in an editorial on the subject, there is a decided note of moderation, and a recognition that the virtues of illumination are not all on one side—neither of electricity nor of gas. There is truthful acknowledgment that the inverted gas-burner under ordinary low-pressure supply has reached an efficiency of 20 candles per cubic foot of gas, and that high-pressure gas-burners are now obtainable that return 60 to 70 candles per cubic foot. Similarly the metallic filament lamp and the flame arc lamps are a big advance on, respectively, the carbon filament lamp and the ordinary forms of arc lamps. It is also admitted that the inverted mantle is an advance on the upright in the matter of strength. But still in this connection it is claimed that the metallic filament lamp has a decided advantage. We will not quarrel over this modest claim, though in regard to physical characteristics, every electrician is aware (though it is not proclaimed from the house-tops) that the metallic filament is not all that could be desired. The price of the metallic filament lamp is confessed to be a serious defect; and it is dearly desired to see the cost down to 2s. or even 1s. In a sentence, however, there is admission that electricity has not yet overtaken gas. "At present," it is remarked, "for interior lighting electrical methods are advancing very rapidly in the hope of overtaking gas methods." Also "gas plant, generally speaking, has the great virtue of cheapness, and possesses means of remote control to which there is no equivalent in electrical devices." In side street lighting, it is considered that there is a very great field for the metallic filament in competition with gas. Here, it is stated, electric lighting is forging ahead. The forging ahead is not so much due to merit as to the fact that so many electric lighting stations are under municipal control. Meantime it is noticed that the harbour at Whitehaven which has been lighted for five years by electricity, is now to be lighted by gas, owing to the terms submitted by the Town Council being too high; and, for similar reason, the lighting of the Crystal Palace Parade is to be retained by gas, though the South Metropolitan Electric Light and Power Company sought to capture it by a flame arc scheme.

PROGRESS OF THE DESSAU SYSTEM OF VERTICAL RETORTS.

We have received from the Dessau Vertical Retort Company of Berlin an elegant *brochure* on the Dessau vertical retort-setting and gasification in vertical retorts. It contains reproductions of photographs of the more important existing installations of Dessau verticals, and plans and sectional drawings of works and plant of interest in connection therewith. The text (which is in German) gives a historical account of the invention and development of the Dessau system, and particulars of a number of installations and of the working results obtained with them.

Reference is made at the outset to the failure of efforts made prior to the beginning of the present century to overcome the difficulties involved in the production of a system of vertical gas-retorts which would work successfully on a large scale. It is claimed that Dr. Bueb, working in Association with the German Continental Gas Company of Dessau, was the first to evolve a successful process for the gasification of coal in vertical retorts. The further development of this process was effected in collaboration with the Imperial Continental Gas Association, and in particular with Mr. Edward Körting, the General Manager of the Association's works in Berlin. The patent rights in the process were taken over by the Dessau Vertical Retort Company of Berlin, which now erects the settings in co-operation with the Berlin-Anhalt Engineering Company ["Bamag"] and the Stettin Firebrick Works.

The essential features of the Dessau type of vertical retort-setting comprise the erection of eight, ten, or more vertical retorts 4 or 5 metres (about 13 ft. or 16 ft. 6 in.) in length in a bed, in which the retorts are generally arranged in two adjacent rows. The producers are placed along one side of the bench of settings, while the regenerative flues are on both sides of each setting. Ordinary mouthpieces are fitted to the upper ends of the retorts; but the lower ends are closed by special lids which are manipulated by means of a lever from a single standpoint for each retort. This is regarded as a very important feature of the Dessau system. The relatively high make of gas which the vertical retorts afford is attributed to reduction of the loss of gas at charging and discharging; diminution of the decomposition of the gas *in statu nascendi*; and participation in the formation of gas of the moisture liberated by the distillation of the coal.

Among the figures quoted to show the working results attainable with vertical retort-settings may be mentioned those for the trial run made to check the fulfilment of the contract guarantees in regard to the installation of sixty retorts at the Genoa Gas-Works. The coal carbonized was English (Thornley), and without the introduction of steam the make per ton averaged 12,236 cubic feet, having a gross calorific power of 628 B.Th.U. per cubic foot.

The advantages claimed for the Dessau system of vertical retorts include a reduction of the amount of naphthalene in the gas to a negligible quantity, and of the production of carbon bisulphide by 50 per cent., and an increase in the yield of ammonia. In regard to the latter, the average yields of (real) ammonia obtained in 1908 at the works in Berlin of the Imperial Continental Gas Association are given for each type of retort-setting, and are as follows: Horizontal retorts with stoking machines, 0·24 per cent. of the weight of coal carbonized; inclined retorts, 0·29 per cent.; vertical retorts, 0·31 per cent. The vertical retort tar is stated to contain only 2 to 4 per cent. of free carbon, as compared with 20 to 25 per cent. for ordinary gas tar, and also 50 per cent. less naphthalene than the latter. The amount of cyanogen in the gas is about 40 per cent. lower, as might be anticipated from the increased yield of ammonia.

These and other data relating to the Dessau vertical retorts are presented in a lucid and interesting manner in the *brochure* before us, which also contains extracts from some reports already given in the "Journal," of the extended trials of installations of these retorts at many gas-works—*e.g.*, Zürich, Cologne, and Mariendorf. The last-named works now has the largest number of these retorts in use—viz., 28 beds of twelves, making a total of 336 retorts. Barcelona comes next with 300 retorts in beds of ten; and the Cologne Gas-Works and the Danzigerstrasse works in Berlin, each have 240 retorts, also in beds of ten. These figures will serve to show that the system, though of so recent introduction, has already achieved a success on which the Dessau Vertical Retort Company and its co-adjutors may be heartily congratulated. The elegant *brochure* which they have now issued is well worthy of careful study.

National Commercial Gas Association.—We have received from Mr. Lucius S. Bigelow, of New York, the Secretary of this Association, the "Transactions" for the year 1908, embodying the proceedings at the third and fourth annual meetings, held in January in New York and in December in Chicago. The volume contains an interesting chapter on the early official history of the Association, of which Mr. Bigelow was the founder rather more than four years ago; and this is followed by a series of illustrations showing some of the work accomplished in connection with exhibitions of appliances employed for the conversion of gas into light, heat, and power. The contents of the book are a record of good progress on the lines originally laid down.

ADVERTISING BY GAS.

THE numerous stallholders at the Business Exhibition, which was held last week at Olympia, will hardly be likely to quarrel with the assertion that one of the most attractive among the stands was that of Mr. C. W. Freeman, where there were on view various beautiful devices which are of importance to "JOURNAL" readers. Mr. Freeman describes himself as an advertising specialist; and the justice of his claim to the title was admitted by a representative who called upon him, and who, almost before he had had time to look round, found in one of his pockets a nicely got-up diary for 1910, in another a leather match-box holder, and attached to his watch a small memo. tablet. None of these useful articles is, of course, without the name or initials of the giver in a prominent position. This proves that Mr. Freeman is an advertiser; but the style of the goods and the method of their bestowal further show that he thoroughly understands his business.

At his stall at the Business Exhibition, Mr. Freeman was making a speciality of gas illuminated advertising signs, &c.; and the number and variety of the designs shown, together with their extreme effectiveness, could not fail to convince any gas man who might see them that by the judicious pushing of these gas-consuming devices, a very useful business might be built up in a direction in which, at the present time, gas is utilized to a comparatively trifling extent. Mr. Freeman's own figure—and it is repeated solely on his authority—is that, of the total consumption of electric light, about 25 per cent. is now used for signs and all other advertising purposes, while the present consumption of gas for similar objects is not 1 per cent., which would mean that gas has practically left the field of advertising free to its opponent. However, Mr. Freeman, with the necessary support of the gas supply undertakings, is prepared to make a gallant effort to alter all this. Of his own enthusiasm in the matter, there can be no doubt; and that he will receive all the aid he desires from gas men seems more than likely from the praise that has already been given to his wares by those who have personally inspected them. Other influential people, also, who have been impressed with this means of advertising, are already considering its adoption on a large scale; and altogether he describes his exhibit as having made "good business."

Mr. Freeman, in the course of a brief interview, expounded a scheme which he sees his way to negotiate and bring to a successful issue, provided gas undertakings will combine and support him. The idea is to provide a universal "poster" illustrating the advantages of gas, to be put up over the country, and then to take suitable premises in different parts, and invite traders to witness demonstrations of what can be done in the way of advertising by gas. A universal poster is suggested so that the funds available may be made to go as far as is possible. In the first place, however, a show-room would probably be fitted up in a central part of London where everything could be inspected by those who might contemplate taking a hand in the scheme. Mr. Freeman would be prepared to visit all parts of the country in connection with the business, and would devote the whole of his time to it, because he recognizes the importance of it from a commercial point of view both to himself and to the gas companies. Here, of course, the scheme is merely touched upon; but full details of the proposal will no doubt gladly be sent to inquirers by Mr. Freeman, if they will address him at No. 107, Cannon Street, E.C. The details can be settled after due consideration; but, broadly speaking, the idea seems to have much to commend it, as a means of stimulating the use of gas for advertising purposes—especially in view of the many ingenious and attractive mechanical appliances that Mr. Freeman has at disposal for the use of traders in this connection.

As to the pictures and signs themselves, these must be seen to be appreciated; hence the great desirability of providing show-rooms where prospective customers can view them in action, instead of relying upon illustrated price lists and printed descriptions. There is, for instance, one sign with which it is possible to get nine different phrasings and nine different colour effects. A model of this is in use now; and arrangements could be made, if thought desirable, for the gas companies to secure the device, and keep it exclusively for use with gas. In other forms, moving pictures are seen, and brilliant flashlights of various hues; and there is also an arrangement in which any pictorial subject can be introduced, and, by means of mechanical contrivances regulated entirely by gas, lights in different parts—in sky, in buildings, &c.—are made to appear and disappear, first in one part of the picture, and then in another. An advertisement of this kind, judging from the picture to be seen at the exhibition, could not fail to prove a good investment. The nine-change sign to which attention has already been drawn (as well as others) is, it may be remarked, controlled entirely by gas. The motive power of the changing mechanism is a small hot-air engine, and the illuminant would be bijou inverted burners.

Mr. Freeman is already confident of considerable support from the gas industry in his projected campaign; and it is hoped that this brief reference to the subject may be the means of inducing others to carefully investigate the matter with a view to joining in the movement. There is certainly much that can be done in the way of increasing the use of gas for advertising purposes; and as a possible means of at all events doing some of it, this scheme is worthy of favourable consideration.

NEW GAS SUPPLY FOR FAZAKERLEY.

Origin of the Scheme.

ABOUT four years ago, the township of Fazakerley, a suburb of Liverpool, was brought within the domain of the Corporation; and in the course of the proceedings incidental to this event, a promise was made that a supply of gas should be provided as early as possible. Up to that time, the greater portion of the district had been without any means of obtaining such a supply, owing to the Liverpool Gas Company's area terminating at the boundary of Walton, and the Company not considering it worth their while to obtain parliamentary powers for the extension of their limits so as to include the Fazakerley district. Accordingly, at a meeting of the Lighting Committee of the Corporation on Nov. 17, 1905, it was decided to take the necessary steps for obtaining a Provisional Order authorizing the Corporation to supply gas for public and private purposes within the township; and on April 20, 1906, the Order was sealed by the President of the Local Government Board.

Early in the following August, Mr. Isaac Carr, of Widnes, was appointed Consulting Engineer, and requested to prepare and submit a scheme for the erection of the works, together with an estimate of the cost. In March, 1907, the Committee decided to make an application to the Local Government Board for their sanction to the borrowing of £25,000 for the erection of the works, the laying of the mains, services, &c.; and, further, that, pending the completion of the works, arrangements should be made with the Liverpool Gas Company for furnishing a supply of gas in bulk for distribution by the Corporation to the consumers in Fazakerley. Meanwhile, the Company made several offers to the Corporation in regard to the matter; but, as they were not considered sufficiently favourable, they were declined. On Jan. 15, 1908, the Local Government Board Inspector held an inquiry on the subject of the application of the Corporation; and the following March the necessary sanction to the borrowing of the money required for the works was received. Mr. Carr was then authorized to proceed with the work of preparing quantities and advertising for tenders for the pipes, and the preparation of plans, specifications, and quantities for the buildings and plant. The following June he submitted three alternative schemes for the erection of the works; and the one chosen has been satisfactorily completed, and was formally inaugurated last Thursday.

Though the Corporation applied for a loan of £25,000, only £20,635 was granted, apportioned as follows: Mains, £2100; services and stoves, £2713; buildings, plant, &c., £15,822. Of the amount sanctioned, £12,710 has been expended to date—viz., for mains, £1764; meters, services, and stoves, £1072; buildings, plant, &c., £9874. There are 5½ miles of mains, supplying 612 consumers and 68 public lamps. The illuminating power of the gas has been fixed at 20 candles, as tested in the No. 7 standard flat-flame burner (the same as the gas supplied by the Liverpool Gas Company); and the maximum price is 4s. 6d. per 1000 cubic feet—a figure which it is confidently anticipated will never be approached.

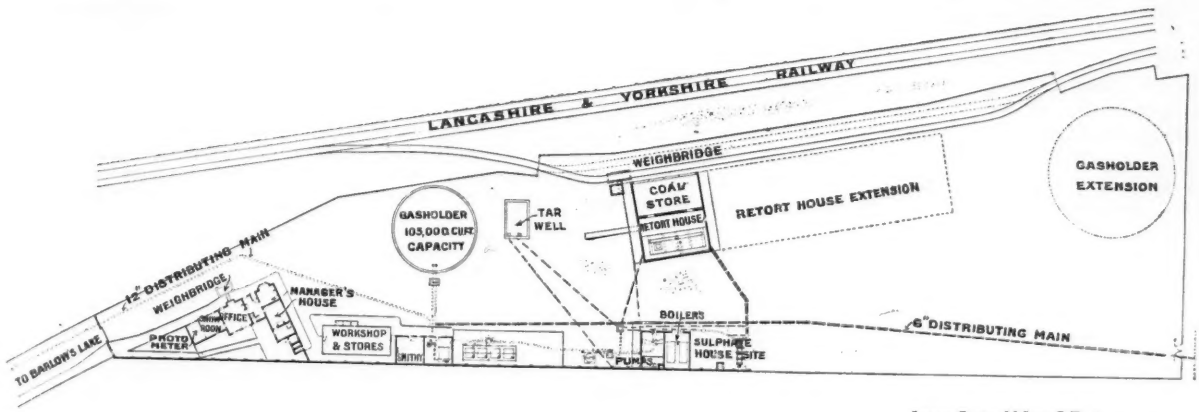
Description of the Works.

The site of the works, which comprises 2¾ acres, is situated on the north boundary of the district of Fazakerley, and has the advantage of being at the lowest level. As will be seen from the accompanying plan, the east end is bounded by Signal Works Road, while the west end joins up to Barlow's Lane; and from this end the main entrance to the works is formed. Tenders were invited; and on the 31st of December last that of Messrs. Richard Costain and Sons, of Moorfields, Liverpool, was accepted for the erection and completion of the dwelling-house and office, gas-works buildings, gas plant, foundations, and gasholder tank, for the sum of £3114 3s. 3d. The work was immediately put in hand; and though serious difficulties were encountered in constructing the works, in consequence of the whole site being comprised of quicksand, the work was carried out in a very expeditious manner. The following is a description of the plant.

Retort-House and Coal-Store.—In the retort-house there is provision for four benches of seven retorts, heated by deep regenerator furnaces, only three of which have, however, up to the present, been constructed; the fourth being left until extensions are necessary. The coal-store, which adjoins the retort-house, has a capacity of 500 tons; and there is a private siding communication with the Lancashire and Yorkshire Railway. The waggons run alongside the store, into which the coal and cannel are discharged direct; after which the empty waggons can be run into the coke-yard for reloading, if required. At the siding entrance there is a 30-ton weighbridge, so that all coal and cannel which are received, and coke, &c., sent out, by rail must pass over the machine.

Condensers, Exhauster, Washer, &c.—The condensers are of the annular atmospheric type. The exhauster-house contains one of the Bryan Donkin Company's rotary exhausters, having a capacity of 12,000 cubic feet per hour. It is driven by a steam-engine. After the exhauster comes the washer, then the tower-scrubber, and afterwards the purifiers, which are of the luteless type. There are four boxes.

Gasholder, &c.—The gasholder is of the spiral-guide type, 60 feet in diameter, and capable of storing 105,000 cubic feet of gas. The governor is 12-inch, and is fixed in the meter-house, near



ISAAC CARR, M.Inst.C.E.
WILLIAM M. CARR } Engineers.

General Arrangement of the Liverpool Corporation Fazakerley Gas-Works.

by which is the smithy and fitters' shop. Alongside is a commodious structure in corrugated iron. It was the first temporary building erected on the site, and is for the time being retained as a store for lamps, stoves, meters, and other fittings.

Boiler and Engine House, &c.—There are two Cornish boilers, of ample capacity, for providing steam required for all purposes on the works, including the manufacture of sulphate of ammonia. It is proposed to erect plant for this on the space left for the purpose between the boiler-house and the condensers. Adjoining the boiler and engine house is the pump-house, in which is fixed the pump for dealing with the tar and ammoniacal liquor. In this house there is also fixed apparatus for utilizing the exhaust steam from the exhauster engine and the liquor pump to heat the boiler feed-water. At a convenient point between the pump-house and the part of the siding where the tar-tanks will be loaded is situated the tar and liquor well, which has a capacity of 100 tons. The other buildings comprise the foreman's house, office, photometer-room, and show-room.

The whole of the *débris* from the gasholder tank and other excavations was used on the site, for the purpose of making the railway siding embankment, and raising the yard level a height of 2 feet above the natural level of the land, which was necessary to give the requisite depth for draining the furnace-room below the retort-house.

The following are the names of the contractors for the plant: Gasholder, retorts, and washer, Messrs. R. & J. Dempster, Limited; condensers, the Whessoe Foundry Company, Limited; steam-boilers, Messrs. Thomas Beeley and Sons; exhauster, the Bryan Donkin Company, Limited; scrubber, Messrs. Westwood and Wrights; purifiers, Messrs. E. Cockey and Sons, Limited; station meter, Messrs. J. & J. Braddock; and station governor, Messrs. Peebles and Co., Limited.

The carbonizing plant has a capacity of 35 millions, and the works, plant, and mains a capacity of 60 millions, per annum. But at present less than half the area of the site is occupied; and the works have been laid down with the idea of being easily extended in the future to a capacity of a million cubic feet per diem, or 250 millions per annum. The whole of the buildings and plant have been erected, and the manufacturing operations initiated, under the superintendence of Mr. William M. Carr (son of Mr. Isaac Carr), acting as Resident Engineer. Mr. A. G. Smith, the Lighting Superintendent of the City of Liverpool, has been entrusted with the duties of Manager of the works.

Opening Ceremony.

The works above described—the first municipal gas-works erected in the city of Liverpool—were formally opened on Thursday, under the presidency of Sir Charles Petrie, the Chairman of the Tramways and Electric Power and Lighting Committee of the Corporation, who was accompanied by several aldermen and councillors, including the representative of the ward of Fazakerley (Mr. H. S. Higginbottom). Present at the ceremony were Mr. Isaac Carr, the Consulting Engineer for the works, Mr. A. G. Smith (the Superintendent of Street Lighting), the Manager, Mr. R. Costain (Messrs. R. Costain and Sons), Contractor, Mr. Samuel Glover, of St. Helens, and other managers of works in the vicinity.

Sir Charles Petrie opened the proceedings by calling upon Mr. W. W. Walker (the Chairman of the Lighting Sub-Committee of the Corporation) to turn on the gas and declare the works open. Mr. Walker complied, and gave a few particulars of the works, an account of which had been distributed in pamphlet form. Following this came the presentation to Mr. Walker, by Alderman Frederick Smith, in the name of the Committee, of a silver afternoon tea-tray, suitably inscribed, as a memento of the occasion. He expressed the hope that, as one effect of the erection of the works just opened, gas would soon be cheapened throughout Liverpool. He proposed a vote of thanks to Mr. Walker for performing the ceremony. Alderman Duncan, in seconding the proposition, said he believed the new gas undertaking would develop largely, and would supply manufactories which were sure to be built in the district, which was at present but thinly populated. Mr. Higginbottom supported the motion; saying he was sure Fazakerley would appreciate the new gas-works, which were a sign of the times and of the promise of the district. Mr. Walker, in acknowledging the gift, expressed the opinion that the Corporation gas undertaking would prove an important venture, and attract many customers.

The company then made a tour of the works, the compactness and up-to-date character of which were admired. Several aldermen and councillors accepted the invitation of Mr. Carr to try their hands at charging a retort; the attempts being more or less amusing.

At the invitation of Mr. Higginbottom, the company returned to Liverpool to partake of luncheon at the Exchange Station Hotel—Sir Charles Petrie again presiding, at the request of the host.

The Chairman proposed the health of Mr. Walker, whose efforts towards the adoption of the automatic lighting of street-lamps in Liverpool he praised. Having acknowledged the economies in gas making which were due to Mr. Carr, he said the Liverpool Gas Company looked with an eye of suspicion on the new gas-works; but the terms upon which the Corporation were informed that the Company's undertaking could be purchased prevented negotiations. For many years some of them had been complaining of the Liverpool Gas Company charging a higher price for gas than that at which it was supplied by other municipalities and companies. They had always said if the Corporation would allow them to reduce the candle power they could lower the price; but the terms were such they could not think of making the alteration. He hoped the Fazakerley works would compare favourably with those supplying Liverpool. Mr. Walker, in response, spoke of his scheme for the automatic lighting of the city gas-lamps, which he expected would save the rates to the extent of from £10,000 to £14,000. He was, however, convinced that it would be wise to defer for about a year the putting of the scheme into operation. As to the new gas-works, he anticipated a large demand for gas for motive power.

Alderman F. Smith proposed "Success to the Fazakerley Gas-Works." He said the Liverpool Corporation had long been watching Widnes, where Mr. Carr gave a high quality of gas at a low price. Thanks to the experience, energy, ability, and research of Mr. Carr, these small works would soon prove of useful service to Liverpool. Mr. Carr, who responded, said he had always been, and would continue to be, a "trier." Owing to the site difficulties, the capital expenditure on the works had somewhat exceeded his anticipations; and he warned the Committee that, as gas was no longer a monopoly, it must be handled without excessive capital. He acknowledged the aid he had received from Mr. Smith, the Contractors, and the firms supplying the plant. Referring to the gasholder, he remarked that it had to be erected on foundations which were beneath 15 feet of quicksand. He was certain that, with the natural and irresistible growth of Fazakerley, the business would be ample, and that the economical manufacture of gas would follow.

The Chairman gave "Our Host;" and Mr. Higginbottom, in reply, pointed to the largeness of the vacant area of Fazakerley, and the many sites available for works and houses. Consequent on the opening of the gas-works, he knew that three firms contemplated the building of works or factories. The works had been erected in the most up-to-date way, and would supply good gas at a fair and reasonable price. Liverpool was a progressive place, and the Corporation had opened these gas-works to make money.

The toast of "Our Visitors" having been proposed by Alderman E. L. Lloyd and duly honoured, Mr. S. Glover responded. He rejoiced at being associated with the Liverpool City Fathers in their new undertaking. Liverpool, he observed, had set an example to other cities in having adopted a beautiful system of street lighting by incandescent gas, notwithstanding its own electric light works and lamps. He came to Fazakerley expecting to see something good; and he was not disappointed. He thought success was assured; but he might be allowed to point out the desirability of regulating the prices of gas in the interests of the consumers. He wished the works every success.

Mr. Higginbottom proposed "Sir Charles Petrie;" and the toast was duly honoured and acknowledged.

High-Pressure Gas Lighting in the City of London.

At the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee made a recommendation relative to the report on the recent inspection of various systems of public lighting on the Continent, to the effect that the Committee be authorized to arrange for some further experimental lighting in the City thoroughfares as suggested in it. The recommendation was received without opposition, and carried unanimously.

THE PROGRESS OF GAS SUPPLY IN TURIN.

CONTINUED progress, but at a rather slower rate, sums up the results of last year's working of the Consumers' Gas Company of Turin, Italy, the annual report of which lies before us. It possesses the characteristics of former annual statements—full, but concise; frank in its information; and attractive in its form, by reason of its interesting illustrations. The President, Signor Cav. Gioachino Fornas, his co-Directors, and the Manager, Signor Cav. Giacomo Beria, are again to be complimented on the matter and manner of their report and balance-sheet, which were presented to the shareholders at a meeting held on the 8th inst.

The rather less rate of increase in the amount of gas consumed in 1908-09, as compared with the previous year, is accounted for by technical considerations. This, indeed, is the story elsewhere and pretty generally; for careful regulation, more careful distribution, and most careful consumption by improved and more efficient burners, all tell their tale, and tend in some measure to restrict the former more rapid rate of gas consumption. The customers of the *Società Anonima dei Consumatori di Gas-Luce*—to give the Turin Company its Italian name—took last year 18,014,805 cubic metres (636,221,000 cubic feet) of gas, as against

Fig. 1.—The New Offices and Governor House Consumers' Gas Company, Turin.

17,649,502 cubic metres (623,320,000 cubic feet) in the previous twelve months. The gas was used in the following proportions: 90·66 per cent. through ordinary meters; 0·93 per cent. through prepayment meters; 5·46 per cent. for public lighting; 1·99 per cent. for industrial purposes; and 0·96 per cent. for motive power. The number of meters went up from 31,403 on the 30th of June, 1908, to 33,243 on the corresponding date of this year. Of these, 33,075 were for heating and lighting, 90 for gas-engines, 78 for manufacturing. The gas sold brought in Lire 2,986,821·53; and the bad debts only amounted to Lire 1915·93—the equivalent, let us say, of a loss of about 6d. in every £40. The public lighting, however, results in a loss of Lire 45,201·83 (£1808).

On the subject of unaccounted-for gas, it is observed that in a large concern it is of the greatest importance to give the smallest detail care and systematic attention. Thus, a general inspection of the whole of the gas-mains, from the largest main to the smallest service pipe for a single consumer has been begun; and by it, it is hoped to reduce the present 6 per cent. of gas lost. Needless to say, the mains have been extended; 5232 lineal metres of new pipe being added, making the total length of gas-mains now about 302 kilometres, or 188 miles. Among the mains laid was one of 1000 millimetres (3 ft. $3\frac{3}{8}$ in.) in diameter; and the placing of a pipe of this size was no light matter in a subsoil already crowded with other pipes, drains, electric cables, and water-mains. But the work has proved beneficial in facilitating the regular distribution of gas to the districts furthest away from the works.

During the year 64,925 tons of coal were carbonized, being an increase of 4346 tons. From this tonnage, 19,262,330 cubic metres of gas were obtained, which represents a make of 300 cubic metres per metric ton, or 10,765 cubic feet per English ton of coal carbonized. Advantage was taken of a slight depression in the price of coal last spring to purchase 40,000 tons at an exceptionally favourable figure, which has not since been touched.

A CULTIVATED COKE MARKET.

The coke market in Turin must, we imagine, be in a very different condition to that with us; for there the only trouble is that there is not enough coke to supply the regular and constant demand. "The sales of coke (says the report) commencing as usual on April 1 had, unfortunately, to be closed at the end of the same month; for, in that short time, we had disposed not only of all that had been left over from the last mild winter, but also of all that was available from the existing production." All contracts then entered into have been completely and satisfactorily executed. Many contracts for the winter supply—that is, from Oct. 1 to March 31—were also entered into; and these are based, not on any fixed price, but with a reservation that the selling price shall be determined month by month. The confidence thus shown by customers is sought to be deserved by care in the treatment of the coke (which is even of more value than the gas), as well as by watching the fluctuations of the market, so as to regulate the prices of a fuel which the climate of Turin has brought into such general use.

Of other bye-products, concentrated liquor and sulphate of ammonia are alternatively produced and sold at remunerative prices. The disposal of tar is a difficulty here, as elsewhere. In Italy, its distillation is in the hands of one important firm, which can use its unique position to the detriment of gas-works seeking to dispose of their tar. At Turin, however, very good results have followed the successful attempts to burn the tar in regenerative

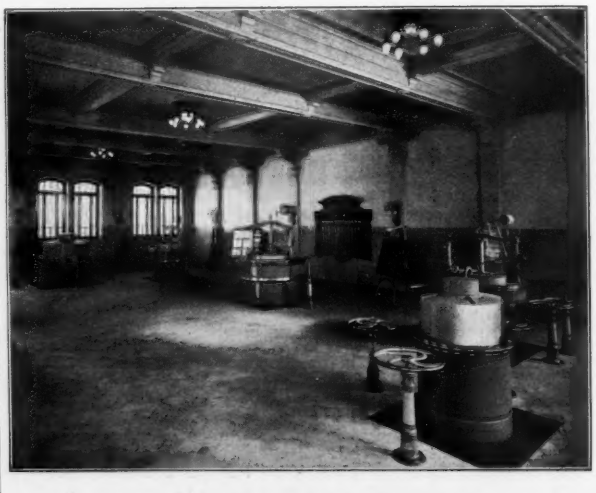


Fig. 2.—Interior of the New Pressure Room.

furnaces. Part of it has also been disposed of for agricultural purposes; and this, it is hoped, will provide an increasing demand.

New Constructional Work.

For some years past, it may be remembered, the Turin Gas-Works have been undergoing considerable alterations and extensions. These have now practically been completed; and the latest addition of a large new governor house with offices (shown in fig. 1), well illustrates the decorative but practical style adopted. The interior of the pressure room is seen in fig. 2; the new automatic governors having all been supplied by the Kölnische Maschinenbau A.G. The result of the introduction of these governors last December has been that the daily charts taken from all parts of the city show a constant and equal pressure. This may apparently involve a less rapid increase of consumption, owing to increased efficiency being achieved; but really, by preventing excessive pressure, such apparatus avoids causes of complaint, and eventually conduces to greater demand. Such demand has, indeed, already begun to make itself felt.

In last year's report reference was made to the completion of a new gasholder tank. In this, Messrs. Samuel Cutler and Sons have now built the gasholder, the photograph of which is shown in fig. 3. It is described as "an imposing and strong structure, which æsthetically as well as technically, is worthy of the highest praise." With this addition, the gasholder capacity of the works is more than the actual make, and is equal to the maximum productive power of the plant.

Messrs. Cutler and Sons are also installing a coal and coke conveying plant in connection with a Fiddes-Aldridge stoking machine, which will serve a bench of five double beds with a single producer per bed. The building of this bench is being carried out by the firm of P. Picard (formerly E. Derval), of Paris. Needless to add, excellent results and economical working are expected from this new retort-plant.

In conclusion, it is pleasing to note that in this interesting report of a progressive and enlightened Gas Company it is recorded that "the favourable results obtained in the past year were due for the most part to the devoted and willing work of clerks, workmen, and lamplighters," to all of whom the thanks and appreciation of the Company are gracefully expressed and accorded.

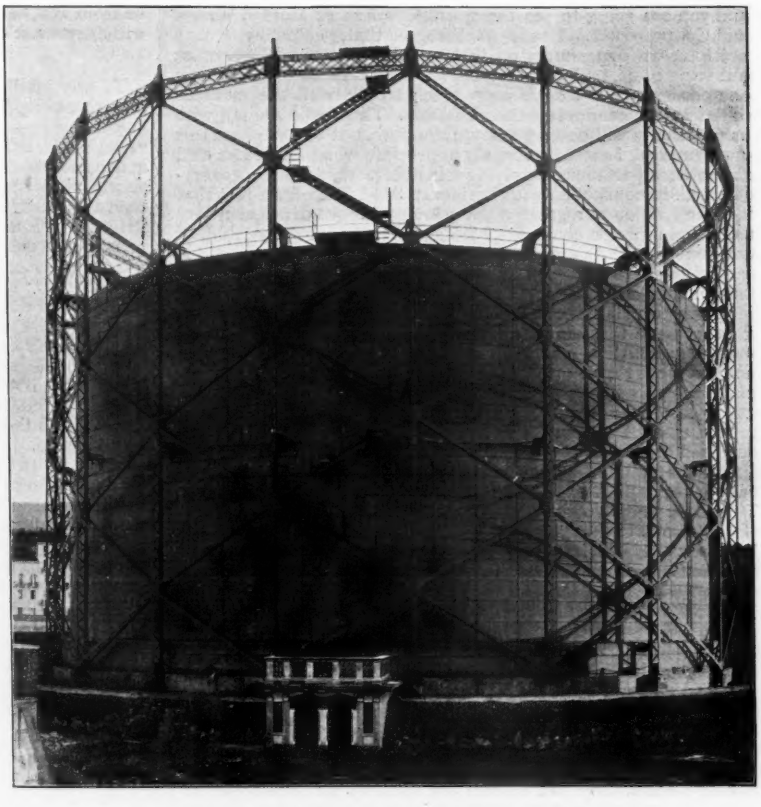


Fig. 3.—The New Three-Lift Gasholder at Turin.

JOHN WRIGHT AND CO.'S NEW LABORATORIES.

Inspection by Gas Managers.

A number of leading gas engineers and chemical experts met at the Essex Works, Birmingham, last Thursday—invited by Messrs. John Wright and Co.—in order to inspect the new laboratories with which the Company have lately equipped their factory, and also the recent further extensions of the works themselves. The visitors were entertained to luncheon before proceeding to the inspection. After lunch, and the reading of several apologies for unavoidable absence—among others from Professor Smithells, Professor Vivian B. Lewes, and Sir Oliver Lodge,

Mr. H. James Yates, F.C.S., the Managing-Director of the Company, who presided, said: I can assure you it gives very great pleasure to myself and my co-Directors to welcome you all here. We know full well that many of you have come long distances, and at great personal inconvenience; and we much appreciate your presence here to-day. It is rather unfortunate that we should have happened to fix upon this particular date, which, quite unknown to us, was the meeting day of the Midland Gas Managers' Association. By the time we learned this, our arrangements had so far advanced that, to our very great regret, it was found quite impossible to alter them. Owing to this clashing of dates, we have been deprived of the presence of some gentlemen with whose company we should otherwise have been favoured here to-day, and some of the gentlemen who are with us will have to hurry off to keep their engagement at that meeting. A number of you have had an opportunity before lunch of seeing round our laboratories. We are, naturally, rather proud of them; and we have great hopes of what we are going to do with them. We know very well that in whatever we do in this way, the primary benefit will be our own; but I think that, indirectly, the result of our research there will ultimately more or less benefit the whole of the gas industry. English manufacturers, we are often told, have been very backward in applying science to their business; but we have recognized for some years past the necessity for this, as is shown by our former test-rooms, which are open for you to see, and in which, in past years, we have done a lot of good work. As regards our laboratory work, a great part of this in former times has been done in a home laboratory. Still, we have done good work, and with our new equipment we hope to do much greater work in the future. As you go through the works, I think you will be struck very much with what is quite an axiom here, and that is standardization. It is the thing that we have aimed at for years. We have brought it up to an excellent state of efficiency; but we intend to develop it still further. It is no use hoping to excel in a business of this kind without machine tools, plenty of them, and these of the most effective and modern types. There was a time when machine tools were almost unknown in the gas-stove industry; but for some years past we have been increasingly employing them in our work. We have so standardized all our appliances that any article of the same sort produced here is absolutely interchangeable with its fellows; and if you were to take any number of parts of the same class of apparatus and throw them together in a heap, you could pick them up and assemble them into complete apparatus without any difficulty. This is a matter of considerable importance to gas engineers in its bearing on the question of maintenance cost. We have a great deal of further new machinery in preparation; and while what you see to-day in that way will, I hope, be interesting, I can assure you, without any exaggeration, that if you were to walk round these works in six months' time, a great deal of what you will now see in the way of machines would by the time of that visit be replaced by newer types. Last year, I paid visits to several foreign countries to see what they were doing. I had the opportunity of seeing many of the best foundries in the United States and in France and Germany; and we are now having machines built in various places, and some in our own works, so that before Christmas we shall have as remarkable an equipment of modern types of moulding machines as have probably ever been gathered together in one foundry. I hope, indirectly and finally, these developments will benefit everyone, though in the first instance it will, of course, be to our own advantage. As a Director of this Company—and I speak for my co-Directors also—I am only too pleased that you have seen your way to visit us and look round our works to-day.

Mr. James W. Helps: Mr. Yates has told us that there will be no time for speeches to-day; but I do feel that all of you will wish me to tender to Mr. Yates and to his co-Directors our very heartiest thanks for the opportunity they have given us to visit their works and laboratories, and for the kind hospitality they have extended to us. There is an old saying that sometimes gratitude is a "lively sense of favours to come." But sometimes people construe gratitude as being an expression of thanks for something they have already received. I think we may combine both these expressions of gratitude to-day, because we have already seen the laboratories and already much enjoyed our lunch,

and you are going to see the splendid works of Messrs. Wright and Co. presently. I very much regret that, personally, I shall not have an opportunity on this occasion of seeing the works; but some of us, including myself, have seen them on more than one occasion, and I have been much struck with the methods of the firm in conducting their business. Those who are not with us personally will be very sorry, I am sure, not to have had this opportunity. I most thoroughly appreciate what Mr. Yates said about the importance of applying scientific methods to one's every-day work in connection with business; and I know for a fact that it is the opinion of a great many people that we can learn very much from foreign countries. No doubt that is the case; but, at the same time, I do appreciate that perhaps scientific methods are carried to great excess, particularly in Germany and some other foreign countries. Education and science there are carried out in a way which sometimes leads to too much standardization. I quite agree that standardization is a very important matter; but lately I had a talk with someone who visited Germany to find out what they were doing, and he found that some German manufacturers were only too glad to get British workmen to come out to do certain work for them. When asked the reason, they replied that the men in Germany were brought up on such standardized lines that some of them had practically no initiative; and if they wanted to get someone to open up new work, they had to come to Great Britain in order to get satisfactory men. This is a point we ought not to forget. On the other hand, those of you who have read the letter which appears in this week's "GAS JOURNAL," from Mr. Charles Carpenter, will remember he told us that his Company, after very carefully going into the matter, had decided to place a large order for retorts with a German firm (notwithstanding the increased first cost), owing to the greater skill used in their production. The South Metropolitan Gas Company recognized the importance of adding scientific investigation and research to a manufacterer's every-day business. But in that letter it was not a question of price or of Free Trade or of Tariff Reform. This had nothing to do with the matter. They knew they were going to spend more money in getting their material; but Mr. Carpenter tells us that, notwithstanding the fact that the Germans had no better material than we had in England for making retorts, they had carried out research with the object of finding the proper way of dealing with, and mixing, the various materials, and this had enabled them to make the retorts so that they would stand a far greater heat, and last very much longer, than the retorts made by British manufacturers. It may be said that the course which they have adopted is very hard on British manufacturers; but that course is taken because British houses had not risen to the occasion, and if they are led to follow on the lines adopted by Messrs. John Wright and Co., the drastic lesson pointed out by Mr. Carpenter may not be lost upon them. We hope this will prove of great benefit to all concerned. I will now ask you to join me in drinking the health of the Company, and that of Mr. Yates and his co-Directors, for the opportunities afforded to-day of seeing what they can do. It appears to me that while they will benefit themselves, they are at the same time helping us.

The inspection of the works—fully described and illustrated last week, pp. 168-73—was then commenced.

MILITANT GAS CONSUMERS, AND OTHERS.

By T. EBENEZER PYE, of Chichester.

MUTUAL confidence, in place of mistrust and occasional bitterness, now happily characterizes the relations existent between the best regulated gas undertakings and their customers; the improvement thus gradually brought about being highly beneficial to all concerned.

Competition—in many districts of a strenuous, and here and there of a thoroughly unscrupulous character—has of course rendered compulsory the adoption by gas administrators of a forward, liberal, and even sympathetic policy towards the general public. To this change in policy is mainly attributable the very emphatic benefits just referred to, and for which therefore the said competition may to some extent be indirectly responsible.

SOMNOLESCENCE.

It is noteworthy, however, that, in spite of the manifestly satisfactory results attending progressive and liberal business methods with our customers, there are yet many undertakings, particularly in small urban districts, whose management obstinately clings to the old and bad traditions, and who will not wake up to the fact that there is to-day no such thing (if there ever was) as a monopoly in artificial lighting—not even in gas lighting. The old days have gone, never to return. In large cities and towns, where both gas and electricity supply are low in price, the competition may be more or less on even terms. In the smaller residential centres, having no factories and little or no demand for power, gas at a moderate price should, under careful management, easily remain "top cock." But wherever the price is above 4s. or 4s. 6d. per 1000 cubic feet, it is almost certain sooner or later to discover in acetylene gas, in oil incandescent burners, or in one or other of the newer systems of carburetted air gas, a competition not to be despised, and none the less formidable from the fact that it must be from the better class of gas consumers that the new-comers will draw most of their custom.

UNREALIZED RESPONSIBILITIES.

To any intelligent observer of the "signs of the times," it is now, therefore, perfectly obvious that, in the interests of the shareholders alone—apart from any other considerations—the excellent "lead" which for some years past has been given us by the managements of many large and not a few small undertakings should, with such modifications as local conditions may render desirable, be universally followed. To fail in this respect is to fail in the discharge of duty. Many directors and members of corporation gas committees have light-heartedly, and perhaps with pride, accepted office without thought of the attendant responsibilities; and the manner in which they shirk those responsibilities and duties is nothing short of a scandal, and constitutes a grave breach of the trust confided to them by shareholders and ratepayers respectively.

"Disputed gas accounts" had been more particularly in the writer's mind when this article was commenced; and a careful study in detail of such a subject promptly reveals its close relationship with the policy under which the respective undertakings are governed. The militant gas consumer may, like the poor, always be with us; but his own virility, as well as his power to influence adversely the neighbouring customers, will depend in direct proportion on such degree of success as is achieved with customers generally by the good management and liberal trading methods of the gas undertaking. Hence the promptings which have given rise to the preceding paragraphs.

Since commencing on the study of his subject, the writer has had occasion to pay a visit to a town where complaints reach him on all hands of bad service of gas, high price, and high-handed treatment of customers—an unholy trinity unfortunately not as uncommon as one would wish—and which complaints certainly seem to constitute a serious indictment against the management. The position is greatly aggravated by the fact that there has to be met a very aggressive and enterprising electric competition. It is not surprising to note that, under the conditions named, electricity practically commands the whole of the more important artificial lighting of the town; and the effect of this success on the gas undertaking appears, to an outside observer, to have been demoralizing rather than stimulating. The position, to the writer, appears deplorable and inexcusable. The neglect and indifference which have allowed such a state of things to come about seem, in view of all the interests concerned, criminal. Unfortunately, the resultant injury to the industry is not confined by the parliamentary limits of the district of the particular undertaking. There is no doubt that gas companies serving adjacent towns have lost good custom as a direct result of the unsatisfactory condition of gas supply just referred to.

THE DISCONTENTED CUSTOMER ANALYZED.

The discontented gas consumer is usually one of three distinct and independent classes of customers. There is the habitual grumbler, whose bark is worse than his bite, but who apparently considers that, in his diatribes against the company and all its works, he is only discharging an important public duty. There is the man who thinks he has a grievance against the company. Unfortunately for him, he is of a similar opinion with reference to all and sundry with whom he may condescend to place his custom. And there are always among our customers a certain number who really have more or less ground for dissatisfaction. Possibly such a one cannot get satisfactory lighting throughout his house, try as he may, owing to the usual trick of the jerry builder, of piping the premises with tubing of ridiculously small bore. Or, worse still, the piping may have been so badly put in as to cause accumulation of water in some inaccessible position—a never-ending cause of trouble and of friction between producer and consumer. Or, as occasionally happens, the meter may register any abnormal amount of gas consumed, the cause of the increase in which is a mystery unaccountable alike to the customer and to the gas officials.

The first-named of our malcontents—the habitual grumbler—is the most readily dealt with. To take him seriously would very probably give him a shock. A final suggestion of sending a fitter round to look into, and report upon, his cause of complaint will probably not be accepted. He derives considerable pleasure in the exercise of his irritating habit, and unless you are sure that there is something that should be done for him, you will not wisely deprive him of that pleasure, and risk his resentment. To smilingly write out the receipt while he grumblingly prepares your cheque will be more diplomatic than to show to him that his complaints are groundless. Such men as these are often enough at heart the best friends of a well-conducted undertaking.

THE MAN WITH A GRIEVANCE.

Of No. 2, I can hear many a collector say: "Oh! he's a brute!' Probably very true; but still you don't wisely tell him so. Here, again, diplomacy is required. These men talk a lot and exert a fair amount of influence. As a rule they are to be taken seriously, and, if possible, must be secured on our side. The grievance probably has some slight iota of foundation which, owing to this man's undue sense of proportion, is magnified into some stupendous rock of offence. It is very curious what fine imposing structures such a man can erect on the flimsiest of foundations. Spare no pains in getting at the very bottom of the trouble. This alone will secure favour, and while confidence in his own case is

weakening, the truth comes to light, and all at once the cherished grievance falls to pieces like a house of cards. You secure a sound and permanent supporter. Gumption does it!

Now as to No. 3, this is where the real tussle begins. Here you have a man who really has cause of complaint; while you on your part are doing, and have done, all that can be expected of you to serve him well. Take the first case stated. It has been stated many times before, and will be again. It is a thorn in the flesh of many a worried gas manager. The writer has a nest of such cases in an aggravated form. An important residential suburb has recently been developed on the outskirts of his district.

Faulty Carcassing.

When some years ago the district was being laid out, and the residences were being built, electric lighting was all in the air. As a consequence, almost if not all the buildings were wired for electricity—some were piped with very small gas tubing for just a few points, and long services of ½-inch and ¾-inch pipes were laid by the builder across the gardens into these self-contained residences. Electricity not being available as promised, the residents naturally applied for a gas supply, which has been given through the service-pipes of small bore. The result can be imagined. The houses having once been piped, the residents naturally decline to have their homes disturbed by troublesome extensions and alterations to the existing fittings. Still less will they have their gardens cut up for the renewals of service-pipes.

The difficulty has to some extent been met by increasing the initial main pressure throughout the district by about 5-10ths of an inch, simply for the benefit of this suburb alone. But at what a cost in unaccounted-for gas! In a few cases, the gas company have been able to successfully intervene before the houses and gardens have been completed. In others, supplementary pipes have been run up in unimportant positions and connected on to the distributing systems, with full success. Now, however, that electric lighting has actually been established in the district, there is no doubt that, if the gas company are to hold their own, they will have to do a lot of this extra piping work at their own cost. To secure a full and satisfactory service, at whatever cost, has now become an absolute essential to the continuance of custom. What an object-lesson in support of the policy of a perfect look-out over all new property in course of erection! This man, then, must be met half-way. If the company cannot give a plentiful and uniform supply by means of his existing system, it becomes a matter of calculation as to how far the prospective business will justify an outlay to provide the means of an efficient supply; and a wisely conducted undertaking will act accordingly.

The same principle must operate in respect of work badly executed. Thoroughly efficient service is to-day an absolute essential to custom, and obstacles to efficiency must go. No hard-and-fast rule can, of course, be laid down as to the extent to which the gas undertaking should at its own expense improve property belonging to others, and in respect of which improvement it can maintain no sort of claim. But the broad principle of control, or at least of access or supervision, from works to burner must be conceded, if the best and happiest conditions of service are to be secured and maintained. The means by which such control is to be obtained must, of course, depend on local and individual circumstances; but firm guidance of the undertaking under a liberal, if sound, policy will, as a rule, settle all such points with wisdom and facility.

Vendors of Heat and Power.

We are to-day looked upon as vendors of light, heat, and power, rather than simply as suppliers of gas. Under the old conditions, our duty was held by all parties to be discharged by the provision at the meter-outlet of a full supply of good-quality gas. But the development of heat and light from the various agencies available has now attained too high a scientific level to be fully understandable of the ordinary lay mind; and it is practically impossible for the average customer to secure, without some more or less expert assistance, the best results obtainable from the particular medium of heat or power which he may favour. This fact applies, perhaps, as regards lighting, with somewhat more force in relation to gas than to electricity, owing to the facilities afforded for the regulation of the modern burner, to suit local conditions, up to the highest point of efficiency, and for inexpensive renewals of mantles, the illuminating medium—facilities which are naturally made the most of by the experienced gas-fitter and which, so far, are denied to the user of electric lamps.

The preceding paragraph is not the digression which it may appear to be. It emphasizes a fact often lost sight of by the public, and not infrequently by the gas-supply officials—viz., that the average user of the modern gas-burner is practically dependent upon his supply undertaking to enable or to show him how to obtain the full value of the appliance. Even the "Trade"—*i.e.*, outside the undertaking—often enough fails lamentably in this respect. Quite recently the writer was amazed at the confession of a gentleman—a managing partner in a large ironmongery and gas-fitting business in a neighbouring town—who assured him that "the people of his district couldn't use the inverted-burner because they found that 'it smoked so!'" Neither he nor his fitters knew anything of adjusting the burners. Ignorance of the first essentials to success in the use of inverted burners is, unfortunately, characteristic of the average gas-fitter outside the gas-works staff. Hence the management of the undertaking is lamentably failing in its duty unless it provides every possible facility for the assistance, and even the instruction, of the customer with regard to the appliances that he has to use, whether for lighting, cooking, heating, or power.

To return now to our malcontent. Whether his trouble be due to bad fitting or to other cause outside his control, or be due to his own ignorance, carelessness, or negligence, or a combination of all three, it is the duty of the supply undertaking to do all in their power to secure for him satisfactory service, and generally to enable him to enjoy the best results possible from the business which he does with them.

The Abnormally Increased Gas Bill.

And now a word about those mysterious increases in the gas consumption as recorded by the meter. First as to the cause. There are occasions when this can never be ascertained. The wilful or accidental neglect of domestics in leaving stoves, cookers, or lights on—perhaps all night, or even for a season—never found out probably owing to the misdemeanant having left the service of the victim ere the gas bill comes in, and such like discrepancies between the reputed "regular habits of the household" and the actual facts as registered by the gas-meter, will often account for the alleged vagaries of the meter index.

An instance is called to mind where one of the meters of a large factory in London showed on one quarter's account a consumption of twice or thrice the normal. The explanation for this was quite beyond the powers of the proprietor or of his staff; and after considerable trouble had arisen between them and the company's collector, the writer was instructed by the engineer to endeavour to ascertain the cause. Gas was being used continuously in the factory; so that the usual test at the meter for leakage could not be resorted to. Eventually, after repeated assurances that everything had been inspected, an attic was discovered at the top of the factory which "hadn't been open for months," but which attic had been used for drying purposes before a large gas-fire. The tap to the fire was turned full on, and had been so for months. The gas was not alight, but it had been escaping into the outside air directly up the chimney, without there being the slightest smell of gas in the room, and without anyone having any idea at all of what was going on. Needless to say that, when the matter was duly reported, there was not much difficulty arranging a settlement of the gas bill.

Safe Lines for Compromise.

The method of arriving at a settlement shall be the subject of the closing paragraphs of this article. Had the engineer insisted on full payment, the account would only have been settled in the Law Courts. And yet the company had legal right to enforce payment for every foot of gas registered by the meter! Palpably, however, owing to the unknown accident of a gas-tap on full bore for months in a closed room, no one had been a bit the better for the gas lost, the customer had received no benefit whatever for the gas that passed through his meter. On this ground, the engineer very wisely decided to compromise the matter and to make a substantial allowance in the account.

It is not, of course, in every case equally obvious that the customer has not derived some proportionate benefit from the abnormal increase in the registered gas consumption of which he complains. But where the company's representatives are what they ought to be, there should be little difficulty in deciding whether the increase be the result of accident, or of carelessness practically beyond the customer's control, or whether he is trying to "rush" the company and is fully alive as to its cause. In any but the latter case, the first step is to make sure of the meter itself, by official tests. If the customer still insists on its being incorrect in spite of tests, every endeavour must be made to bring him to reason; and as long as he will persist in challenging the accuracy of the meter, the company can make no concession. But once get the customer to realize two important factors, and the trouble is over. Let him realize the absolute necessity for the company to stand by its meter—that it is a matter of life and death to the undertaking to tamper with this, its only bulwark—and, on the other hand, that the company desires above all things to be equitable in its dealings, and the problem is solved. The writer has recently dealt with more than one dispute of long standing, of the nature under consideration, in this manner. As a result, the customer has written with reference to the matter somewhat on the following lines:

(1) An admission that the account as charged is correct as to meter registration.
(2) That the meter registrations, in view of the official tests, must also be approximately correct.
(3) That the abnormal increase in registered consumption is absolutely unaccountable, and that all parties are of opinion that, although the gas charged for has been registered, the customer has certainly derived no proportionate benefit from the increased gas consumption, which has been due to some cause outside the customer's knowledge.
(4) Will the company therefore, in equity, make an allowance in respect of this increase, such application for an allowance being, "of course, without prejudice to their position as regards the meter registration."

The result of this action of the customer is that the company is at once in a position to compromise, without prejudice and without establishing any dangerous precedent; and in such cases as have come under the writer's observation, men who as enemies would prove no mean opponents are secured as staunch friends and supporters of the undertaking.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Autumn Meeting in Birmingham.

The Autumn General Meeting of the Association was held at the Grand Hotel, Birmingham, last Thursday—Mr. W. LANGFORD, of Longton, the President, in the chair.

APOLOGIES FOR ABSENCE.

Letters expressing regret at inability to be present had been received from (among others) Mr. J. W. Morrison, the President of the Manchester District Institution of Gas Engineers; Mr. T. H. Duxbury, the President of the North of England Gas Managers' Association; and Mr. Charles Meiklejohn, the past Secretary of the Midland Association.

DEATH OF A FOUNDER OF THE ASSOCIATION.

The minutes of the previous meeting having been confirmed,

The HON. SECRETARY (Mr. Harold E. Copp, of West Bromwich) announced that since the members last met one of the founders of the Association—Mr. John Tindall, of Walsall—had died at the age of 79. He (Mr. Copp) wrote to the relatives conveying the sympathy of the Association with them in their bereavement, and also sent a wreath in the name of the Association. His action had been approved by the Committee.

PROPOSED REVISION OF THE RULES.

The HON. SECRETARY said it had been evident for some time that the rules of the Association might be amended with advantage. In the short period during which he had held office, two or three anomalies had come under his notice; and the Committee felt that the time had arrived when something should be done to recast certain of the rules. Acting on instructions from the Committee, he had obtained copies of the rules of other District Gas Associations; and he suggested that a Committee should be formed for the purpose of dealing with the matter.

The PRESIDENT said he considered that, as an alteration of rules was so important, it would be desirable to have the assistance of some of the ex-Presidents, and any other members they might like to appoint. The suggested Committee could revise the rules and bring them before the next annual general meeting for approval.

Mr. J. F. BELL (Derby) moved that the present Committee, along with the ex-Presidents of the Association, form a Committee to revise the rules for submission to the next meeting.

Mr. A. T. HARRIS (Market Harborough) seconded the motion; and it was carried.

WELCOME TO VISITORS.

The PRESIDENT said he should like, on behalf of the Association, to say how proud they were to have with them the President of the Institution of Gas Engineers (Mr. J. W. Helps). He took it as an honour to the Association that the President should have come all the way from Croydon to be present at their meeting; but it was only another evidence of the interest he had for, and the kindly feeling displayed by him towards, kindred Associations. He (the President) was also pleased to see Mr. Wilson, of Glasgow, a Vice-President of the Institution, and Mr. John Young, of Hull, as representing the Eastern Counties Association. Their presence showed that they were related, and were all working for the same object; and to these gentlemen he extended, on behalf of the Midland Association, a hearty welcome.

READING AND DISCUSSION OF PAPERS.

Mr. George Helps (Nuneaton) then read the paper entitled "Notes on Income-Tax and Assessment," which, with a report of the discussion on it, will be found on p. 248. It was followed by a paper by Mr. W. J. Rendell Baker (Great Malvern), on "Some Aspects of Recent Competition," which is given on p. 251.

ELECTION OF OFFICE BEARERS.

The HON. SECRETARY then announced that the following officers had been elected for the ensuing year:—

President.—Mr. Vincent Hughes, of Smethwick.
Vice-President.—Mr. J. H. Brown, of Nottingham.
Hon. Treasurer.—Alderman W. R. Cooper, J.P., of Banbury.
Hon. Secretary.—Mr. Harold E. Copp, of West Bromwich.
New Members of Committee.—Mr. J. Ferguson Bell, of Derby, and Mr. C. H. Webb, of Stourbridge.
Auditors.—Mr. W. W. Townsend, of Hereford, and Mr. W. J. Rendell Baker, of Great Malvern.

Mr. HUGHES, in acknowledging the compliment paid him by his election as President, said nothing would be wanting on his part to make his year of office a successful one; and in this endeavour he felt sure he could rely upon the assistance of the Committee and members of the Association.

VOTES OF THANKS.

A vote of thanks was accorded the Hon. Treasurer (Alderman W. R. Cooper, J.P.) for his services; and also to the Auditors.

This concluded the business.

The members subsequently had "high tea" together at the hotel—Mr. Langford being in the chair.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION

An Address by Mr. Corbet Woodall.

The Opening Meeting of the Association for the session 1909-10 was held on Friday evening at the Cripplegate Institute, Golden Lane, E.C., when there was a very large attendance of members to hear an address which Mr. Corbet Woodall had kindly promised to deliver. The chair was taken by Mr. W. J. LIBERTY, the President of the Association.

MINUTES OF THE PREVIOUS MEETING.

The HON. SECRETARY (Mr. S. A. Carpenter) read the minutes of the last meeting; and they were confirmed.

THE ASSOCIATION.

The PRESIDENT said that, in welcoming the members to their new session, he did not think he could do better than refer them to the programme which had been issued. Here they would find a variety—lectures, papers, and visits to works—which it would be admitted formed an educational syllabus. In the interregnum between the two sessions, one or two matters had occurred which called for comment. All the members had been very pleased to hear that Mr. J. M. Campbell had been translated from Luton to Margate. Mr. Wilkins had gone from Lea Bridge to take the managership at Godalming, and Mr. C. E. Rosevear had been moved from Goswell Road to Hythe. This was as it should be, and caused them no feelings of regret, because it was for this very purpose that they were banded together in membership. Then the list of their honorary patrons had been strengthened greatly by the inclusion of the names of Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, Mr. T. Goulden, the Chief Engineer of the same Company, and Mr. W. Doig Gibb, late of Newcastle, and now Chief Engineer of the South Metropolitan Gas Company, Mr. A. F. Phillips, and Mr. Stanley H. Jones, of the Commercial Gas Company. Among their honorary members, also, they numbered Mr. W. B. Farquhar, the Engineer and Manager of the Ilford Gas Company, who was formerly one of themselves. In addition, there were some new ordinary members, who were present for the first time that evening. Of their patrons, he was pleased to see there, besides Mr. Corbet Woodall, Mr. A. F. Browne, the Hon. Secretary of the Southern Senior Association, and Mr. F. W. Goodenough, Mr. E. W. Pilbrow, of the Gaslight and Coke Company, and Mr. Farquhar. He had now to call upon Mr. Corbet Woodall to give them the remarks which he had prepared, and which they would all be delighted to hear.

Mr. CORBET WOODALL, who was greeted with loud applause on rising, said it had given him great pleasure to meet the members that evening; and he was glad to see among the audience a number of faces that were by no means strange to him. He then proceeded to deliver the following address.

MR. CORBET WOODALL'S ADDRESS.

In addressing an Association such as this, mainly composed of young men occupying, for the time being, subordinate positions in our common calling—posts which are nevertheless of as great usefulness as any of the more conspicuous and lucrative appointments to which you may hereafter succeed—I am very forcibly reminded of the saying about the different kinds of speech that become those who are putting on their armour and those who are about taking it off; for I have now borne my own professional equipment a very long time, and shall have no further use for it when many of you will be entering upon your prime. Therefore, it is natural that I desire the few words I have to speak shall carry encouragement and be not unworthy of your remembering.

The saying to which I have alluded is usually repeated to check youthful presumption; but, regarding it from my point of view, I see in it a warning to the veteran, who is always under strong temptation to fight his battles over again with tiresome prolixity. A wise writer has remarked that the aged can rarely give much useful counsel to the young; and if this means that the men of every successive generation must work out their own salvation in their own way, I agree. Yet the rule should not be overstrained. There are some vicissitudes of life which do not alter from generation to generation; and upon many heads the testimony of experience is properly sought by those who have only been told the plain old truisms in which they are preserved. "I have been young and now am old," is a formula likely to awaken at least curiosity in those addressed.

THE INDUSTRY OF GAS MANUFACTURE AND SUPPLY.

I want to keep clear of the two rocks—of wearisome personal reminiscence, and preachment. I shall therefore try to eschew individual recollections and keep to general views of our industry, and what I believe to be the best course of those who would prosper in it. Our industry—the great national industry of gas manufacture and supply—has often been made a byword for the paralyzing influence of a statutory monopoly, which has been supposed to keep it wrapped and lapped in artificial security. It has never caught the public eye like railroading, steam navigation, harbour making, electricity, or motor-car engineering, to say nothing of the youngest scion of the long engineering family,

aviation. Its triumphs do not make interesting popular reading. Those who enter this calling vanish from the ken of picturesque writers and orators who award what passes for contemporary fame, and they must be content to know that, whatever their services to their time and generation, they will never have occasion to blush for the facts becoming known.

PUBLIC STREET LIGHTING.

Even science has but a distant bow for gas, while cherishing so many other children in her bosom. Yet the followers of our industry can point to a bright record of benefit incidentally conferred upon the community, as an effect of their labours. Consider the single service of public street lighting, now at last receiving something like proper attention in the City and County of London. I speak of it in this way because I have incidentally more than thirty years' close acquaintance with this particular use of gas, and of dealings with the London authorities who are, and have been, responsible for the public lighting of the streets and bridges of the First City of the World. "The Lights of London" are very familiar to me. The earlier of my memories of them are as the recollection of a bad dream. They go back to a London divided among different Gas Companies in a length of street, and covered without system by a larger number of highway authorities, who, without exception, pursued a cheeseparing policy in the lighting, rather than offering any inducement to the Gas Companies to improve it.

For many years only such inventions and systems as had for their object the saving of expense had the smallest chance of adoption by the authorities. The lamp-columns and lanterns were deplorable fossils—many of them relics of the reign of George IV.; and they were spaced as far apart as any easy conscience in the matter would permit. The idea of lighting even the main thoroughfares so as to increase the attractiveness and security, and to facilitate the night traffic of the capital, had not been born in the minds of the disconnected parish vestries, nor could it be truthfully said that the value of brilliant lighting, as an aid to business, was better understood by the ordinary run of shopkeepers.

Thirty years ago, the Phœnix Gas Company—urged I am bound to admit by what was being done in the direction of electric street lighting in Paris—made an onslaught upon this hoary tradition; choosing for the scene of their operations an important road in the South of London. Their effort was strikingly successful, and may be fairly credited with the opening of a fresh chapter in the history of the public street lighting of England which is still being writ large all over the land.

The system of lighting by high-pressure gas recently introduced provides effects that are singularly beautiful, while the cost, judging from the standard of efficiency, is less than that of any other system. It is to be regretted, however, in the interest not of our industry only, but of the general public also, that efficiency is not always the first consideration, especially where municipal ownership of electric undertakings obtains, in awarding judgment.

The smallest towns provided with gas are now brighter and more cheerful at night than the West-End of London was at the period of which I speak. Not merely are the means of public street lighting better, but they are appreciated by the people. A great deal more money is now found for this service; and it is money well spent—of course, when the illuminant is gas. As to this point, however, I imagine that few of you are unprepared to demonstrate off-hand that gas gives better value for money than electricity, so I will not waste time in telling you what you know.

INDOOR LIGHTING, ETC.

What is true of our streets is equally true of the homes and places of business or public buildings lining these brightened thoroughfares. The incidental benefits of the cheap gas of to-day would baffle any but the most encyclopædic mind to distinguish. Of course, gas supply is not a philanthropic enterprise; and the social, not to say moral, bearings of any respectable calling are not to be dwelt upon too much by those who follow it for the sake of a livelihood—that way lies self-righteousness. All the same, I think we have the right to feel comfortably pleased, apart from business considerations, over the reflection that, whenever a slot-meter installation replaces something less convenient in the housekeeping arrangements of a cottage or tiny flat dwelling, or a gas-cooker lightens kitchen labours, or a gas-fire dispels chills and helps to clear the sky of smoke, it is of the nature of a good deed, to be scored up to the credit of the industry.

DEVELOPMENT OF THE GAS INDUSTRY.

You who have entered into the service of this important and necessary industry will be safe in regarding the development it has exhibited during my time as an earnest of its vitality and capacity of further expansion in the future, when it will be your turn. From year to year I see no evidence of exhaustion, or even diminution, of the prospects of improvement. There certainly never was more activity of mind and invention operating in this direction than at the present time. Therefore, the chief object of your present solicitude should be, and doubtless is, as the existence of the Association proves, the proper equipment of yourselves for the work that awaits you. This thought brings up the ever-recurring problem of suitable education for men of your stamp, which cannot be ignored on such occasions as the present. I am sure we are all wearied of the incessant talking and writing about technical and professional education which is forced upon our attention at every turn, in season and out of season. I feel strongly tempted to exclaim sometimes, when one professor declares it to be necessary that every gas manager must first be a chemist, another that he must take a degree in physical science, another that he must spend three or four years at college before going into the shops, and so forth and so on—I feel like crying "A plague on all your houses; throw the man into his job, and let him find out for himself what it is desirable he should know." All that the best teaching arrangements can do for a man is to put him in the way of teaching himself. Start cramming young men upon some *à priori* assumption of what they ought to be taught, and you run risk of spoiling good workers to make poor intellectuals. It seems desirable to protest to-day that it is quite possible to have too much higher education, after the fashion of the schools. I read the other day some remarks of a returned Colonist who, after extolling the free educational facilities of his Colony, naïvely went on to say, in answer to an inquiry about emigration prospects, that good workmen, agriculturists, and domestic servants were in great demand at high wages, but clerks, "&c.," were already too plentiful local products. He possibly did not see the irony of his statement.

THE QUESTION OF EDUCATION AND TRAINING.

Wherefore, I make no apology for speaking to you of the need of better education of gas men, from the practical bread-and-butter point of view. Let it be understood at once that education never stops while the man remains on the active list. His youthful schooling is only preparation, for there are none other than preparatory schools in existence. There lads are supposed to learn how to learn. In a gas-works they see what to learn, which is where the college ought to come in useful. The difficulty—and it is a grave one—has been, and is, how to render the advantages of college study and instruction available by the most promising men in the service. The Royal Navy has the advantage of being able to arrange this without breaking a man's employment. When he is judged to be in a fit condition to further assimilate the fruits of quiet study and association with the most eminent experts, a naval officer takes a turn ashore, be he lieutenant or rear-admiral. Afterwards he goes to sea again.

Some such division of both active work and study would, in my opinion, be helpful in the great industries. The Gaslight and Coke Company have recognized this need in the case of certain of their employees, and are trying to meet it. They have erected a set of shops at Horseferry Road, primarily for the education of boys entering the service as fitters. These lads are in charge of capable artizans, and are taught the practical work which will later fall to their lot. But on three afternoons each week they attend the London County Council Technical Schools in Vincent Square, and are able to push on with appropriate studies, the value of which they learn to appreciate in the shops. So also with the elder men, lectures and classes are held through seven months in the year, by which it is sought to instil a knowledge of the principles underlying their work—a knowledge they had no means of acquiring before entering the service.

Meanwhile, it is your part to be continually knocking at the doors of the board rooms for help and guidance. You must show eagerness to improve your minds by making the best of what is already provided. I must say I should like to see, in young men aiming to qualify as gas managers, superintendents, and the higher offices in the industry generally, a greater keenness for technical study, and also a better appreciation of the business side of technical matters.

It appears to me that young men going in for gas employments might in some respects take a leaf out of the book of the corresponding order of electrical engineering students, who are nothing if not good theorists—that is to say, they are aware of having everything to learn about their elected science, and know that this cannot be won by the light of nature. The less strenuous sort of young man in gas-works, or in the gas office, whom I have in mind, does not take his task so seriously. There is plenty of hard reading to be got through by anyone who desires to take rank as an expert in gas technics. The history alone is voluminous, and there lies buried in it much that is continually cropping up again, with a difference. I do not recommend any course of study simply for the material reward it may bring. The habit, once acquired, never remains narrowly confined to utilitarian literature. There is controversy over the place of general culture—what used to be called the "Humanities"—in a modern practical educational curriculum; but I really do not share the anxiety expressed, lest the acquirement of useful information should prevent the broadening of men's minds by humane letters. It all depends upon the quality of the individual mind. If this is only adequate to the grasping of the indispensable elements of knowledge, it is better that the man should have those put in his way than have his mind choked by the correspondingly small smattering of useless "scholarship," which is all that remains of many a costly schooling and college course of the old-fashioned sort.

Our industry belongs, I think, to the same order of callings as seafaring and farming, as an occupation that has to be lived in, and be followed early if it is to be fully mastered. Gas manufacture and supply constitute a trade—a trade based upon science and technics, truly, but still a business calling for aptitudes and personal qualities not to be found in books. There is very much to think of in managing a gas-works that would hardly be suspected by anyone who had not grown up amid such cares, until the foresight thereby engendered becomes habitual. Against this grinding-in, however, must be set off sometimes the defects of indifference to outside, or theoretical, suggestions on one side,

and ignorance of ordinary commercial principles and ways on the other. Thus men exclusively brought up in gas-works may not easily shine either as scientific men or as men of business. While young especially, and under superior officers, they are apt to fall into the rut of routine, recognized elsewhere as the "public institution" habit of acting by rule and regulation, where the smile or the frown of the superior are supreme. When his own master, the mere routineer, without a stain upon his character, may yet prove an unprofitable servant. He is liable to be too fond of his own office chair, and his regular morning stroll through the works. Worse, he may limit his care and interest so exclusively to the affairs of his own company as to feel indifference when neighbouring concerns happen to show a slower rate of increase, or be less prosperous than they should be. This is not a right spirit, nor is it good business. The industry, as a whole, commands our allegiance, and expects every man to do his duty by it. Therefore, I hope you will always be ready to help a brother with information if he can use it to his advantage, and with sympathy at all times.

We have to deal in our industry with two contributaries towards the production of the desired profit—the financial and the human. Capital never sleeps, and never dies. Every pound called up has to be paid for, practically in perpetuity. Wherefore its increase should be jealously watched, and every possible means of reducing the dead-weight to be carried anticipated and applied. Money spent upon the machinery now so largely employed in manufacture, again—tenant's capital, as we distinguish it—must never be allowed to rest. Machines do not tire; but they grow old. Keep them moving; wear them out, and buy more.

THE TRUE AIM OF CO-PARTNERSHIP.

As to the human factor in our working, I rejoice that I have been permitted to assist in large conversions of salaried men and wage-earners into co-partners with their employers. This also is education. It will, I hope and believe, prove good husbandry, too. I do not mean by this that those who have been admitted to this new position in their own world are merely to be expected to recoup the employer for so much addition to their pay, and there an end. If so, it would justify those who, with small faith in the movement, belittle it by the name of a system of "deferred pay." If that were all, a simple raising of the rates of wage, or a measure of insurance, would be easier to manage. What I seek is a satisfaction of another kind than the quiet conscience of a good employer. It is for the gulf between Capital and Labour to be spanned by a plainly united interest strong enough to carry mutuality of understanding, and eventually of sympathy. The gain must be constitutional, working both upward and downward through the whole organism, not particular to any member.

In a recent important speech of the French Prime Minister, M. Briand, he said: "For himself he could not believe that the conflict of Capital and Labour was bound to be eternal. He felt convinced that some radical solution would gradually be evolved; and he looked to some form of profit-sharing with employees as holding out a favourable prospect of such solution." So held our late friend, Sir George Livesey; and to-day we are mostly, in that respect, his disciples.

There is just now much vague talk of Socialism, Collectivism, Nationalization, and other symbolic expressions pointing to some revolutionary change of the basis of human society, assumed to be a necessary preliminary to the bringing in of a Golden Age; but the underlying idea of them all is that of force, which cannot be a remedy. People are to have something done for them by an abstraction called the "State," to which they need not respond by any change in themselves. The idle and shiftless may remain idle and shiftless still. I believe this to be putting the cart before the horse. We are thankful to see the Legislature engaged increasingly upon plans for the improvement and cheapening of education, upon the better housing of the poor, in aiding temperance, and other social reforms.

So far "we are all Socialists now." All this is good, but from the beginning, true progress has proceeded from the individual, and social amelioration has followed, not led, men's rise to higher things.

THE FUEL STANDARD.

I have witnessed much in gas manufacture and its applications of the adaptation of means to ends, and have watched great and radical changes of methods and aims. The end is not yet. The purely illuminating power standard of the quality of the supply is actually in process of yielding place to the fuel standard, which we have consented to accept provisionally for the Gaslight and Coke Company, without emancipation from the photometric test. This may be regarded by some as a temporizing expedient; but even so, it is in the way of development. It is better to go ahead slowly than to stand still or to incur the risk of having to turn back. The great thing is to be travelling in the right direction; and there is no gainsaying the fact that we are taking a lead along an open road. All modern uses of gas, without exception, come into the category of fuel purposes. This is now our market. We must supply what the public needs, in competition with keen rivals; and it is our business to ascertain the nature of the wants before undertaking to meet them.

PUSHING THE SALE OF GAS.

For this reason, we have opened up fresh trading developments, and now seek custom instead of waiting for custom to come to us. The centre of gravity of our solicitude has so far become displaced. We still strive unremittingly—indeed, more strenuously than ever—after economy of production and working; but it is recognized that good works' management is no longer everything, and must be accompanied by an enterprising sales department. A decimal part of a penny saved in the cost of gas in the holder, or in administration, is of great value; but the cheapest gas needs a market. The industry at large (outside London and the suburbs and other growing districts) is apparently passing through a period of arrestation of growth, consequent upon the adoption by consumers of more economical ways of using gas for lighting and heating—a movement, be it said, initiated and led by ourselves—and also due to slackness of trade. Yet when one learns of the remarkable response of certain small, stagnant Irish towns to energetic cultivation of the latent potentialities of gas, it is difficult to believe that like success would not follow similar efforts elsewhere. I have heard of a worthy inspector who, if called to a house with reference to a complaint, thinks he has lost an opportunity if he comes away without an order for another gas-fire or two. This is the kind of man for our business.

CARBONIZING METHODS.

Nothing has been more remarkable in contemporary gas engineering than the openings that have been found for improvement in some of the most settled processes of the manufacture and subsequent treatment of gas. Not to discuss the new carbonizing methods, which are "on the knees of the gods," who would have imagined that, at this time of day, an altogether new system of working horizontal retorts would become the fashion? The whole apparatus of carbonization is in the melting-pot. Everything in and about manufacturing and purifying plant has been subject to much alteration since the beginning of the present century.

GAS-WORKS NEED NOT BE A NUISANCE.

One thing I rejoice at—the old character of gas-works as offensive factories is being materially improved, if not wholly reformed. There is really no substantial reason why gas-works should be a nuisance. This point, of avoidance of offence, will become more important as time goes on, and the holes and corners for hiding works away grow more difficult to find. A well-designed works ought not to be ugly. We have many which are an example of what factories should be; and the number is increasing.

CONCLUSION.

In conclusion, I am afraid that the architecture of this address is somewhat of a patchwork order; but I know you are very divided in your positions in the industry, and I trust that some of you will be able to appropriate here and there something that appeals to you. Whatever your connection with the industry, I wish you one and all a successful future in it.

A Vote of Thanks—And Some Speeches.

Mr. L. F. Tooth (Commercial Gas Company), the Senior Vice-President, in proposing a hearty vote of thanks to Mr. Corbet Woodall for his interesting and instructive address, remarked that they had heard a great deal of good practical advice which would be of advantage to all of them. Mr. Corbet Woodall, as they well knew, had very few spare moments; and they ought to feel proud that he had consented to come there and address them. To him (the speaker) the lecture was a book; and he hoped that when it appeared in print, every member would carefully study it. Then when reading, or seeing Mr. Corbet Woodall's name, they would be able to say, "That is the man who opened our eyes."

Mr. T. F. Canning (Ilford), the Junior Vice-President, seconded the vote; remarking that they had heard an address which required study, for Mr. Corbet Woodall had put forward many points with regard to the management of a gas-works. But the whole matter was put in a nutshell by the one statement that economy in carbonizing was not of much use if they had not a sale for the cheap gas that they made. The presence of Mr. Corbet Woodall there that evening should arouse in the juniors an ambition to attain in the industry as high a level as possible. Of course, there could be only one leader, as in a race there could be only one winner; but those who came after had allotted to them places according to their merit, and so could they, by striving to better themselves, obtain positions in the industry in proportion to their ability.

The President then called upon several of those present to support the vote.

Mr. F. W. Goodenough remarked that the Association were to be heartily congratulated on the auspicious opening of the new session, and upon having secured for that opening the presence of Mr. Corbet Woodall, who, as Mr. Tooth had pointed out, had so many calls upon his time. It was, he thought, especially appropriate that Mr. Corbet Woodall should address a Junior Association, because, though he had referred to himself as almost aged, his (the speaker's) knowledge of him told him very clearly that he was the youngest man in the industry so far as related to his lively interest in everything that was new, his vitality, and his keenness for the welfare of the gas business. He (Mr. Goodenough) never made a suggestion of any kind to Mr. Corbet Woodall in connection with the service of the Company in whose employment he was proud to be, without him entering into the question with all the zest of the youngest of them. Mr. Corbet Woodall was one of the most striking examples of the man who grows younger the greater the number of his years; and in this respect he gave them a lead which he (the speaker) hoped they would all do their best to follow—namely, that they should not

allow their interest in their work to flag for a single moment. It was only by taking an interest in their work that life was made worth living; and it was because he had always taken this interest that Mr. Corbet Woodall found himself so youthful at the present day. It had been a great pleasure to be there that evening and hear Mr. Corbet Woodall and meet the members; and he wished the Association every success during the session just opened—a success ensured by them having as their President again this year the indefatigable and enthusiastic Mr. Liberty.

Mr. Henry Austin, after remarking that he had never lost an hour through being late during the 25 years he had been in the service of the South Metropolitan Gas Company (of which he is now an Employee-Director), said he had been delighted with the address, which would stimulate each one of them in the journey through life. He had been particularly pleased with the references to the system which helped a man to help himself, by assisting him to become his own employer. To-day many of the workpeople in the South Metropolitan Gas Company enjoyed a return of £6 or £7 every half year by way of dividend; and this was of great use to them, and made them feel better men in the world. Co-partnership was one of the very best systems ever established between masters and men. It eliminated the prejudice which had previously existed between Capital and Labour. Instead of Labour fighting Capital, it was enabling the labourer to become his own employer. In his own Company, the employees held a very great amount of stock; and the system had been the means of enabling many men to better themselves in life by emigrating to the Colonies. He hoped Mr. Corbet Woodall would live for many years to lead the greatest Gas Company in the world.

Mr. A. F. Browne said that he shared to the full the feelings of gratification with which they had seen Mr. Corbet Woodall among them that evening, and with which they had listened to his full, instructive, and encouraging address. Now, what was Mr. Corbet Woodall's advice to those who wished to attain success in the gas industry to-day? Well, he advised them not only to study words but things; and it was the finest advice that one who knew could ever give to those who were seeking to learn. There was much which they all felt might very easily degenerate into cramming in the education of the present day. It all depended upon the way in which the student approached his task. When they had this advice from Mr. Corbet Woodall, they might take it that his desire was to see the young men who were rising in the industry fully qualified to face the difficulties, the competition, and the scientific knowledge which was necessary to carry on this great industry in the future; and he encouraged them by telling them he believed the future was bright and rosy. Now, if there was one Company who had done more than another for the students in the gas industry, it was the Gaslight and Coke Company. Mr. Corbet Woodall had that night alluded all too modestly to some part of the work that the Company had undertaken for the benefit of the young men. He spoke of apprenticeship or practical instruction in shops. They all knew how this country was suffering from the disappearance of apprenticeship. Youths left school as soon as they had passed the requisite standards, because it was necessary for them to earn a living at the earliest possible moment. As a rule they took anything that turned up; and in a few years, in many callings, they became too old for the work, and were sent into the world again knowing nothing—thus going to swell the ranks of the unemployed. He was struck by Mr. Corbet Woodall's remark about reading. Certainly, it was very wise to read what had gone before. He said they would find in the records of the history of the industry during past years many problems which were continually cropping up afresh, with a difference. It was just this "something new" that they had to be abreast of; and this would take them all their time. He had had something to do, as they knew, with the Gas Examinations; and whether young men were students or had ceased to be such in the ordinary sense (for, as Mr. Corbet Woodall had pointed out, none of them ever ceased to learn, or should not do so), he would venture to urge upon them all not to be in a hurry. They should take their time. To those men who crammed and tried to stuff themselves with a great deal of technical knowledge merely to pass examinations, he would say, "Do not do it." It was not necessary that they should pass these examinations or take these diplomas. What was necessary was that they should qualify for any position they were to take. This would occupy them for years. The address had taught them all a great deal; and he was sure they would study it when it appeared in print, and derive even greater benefit from it then than they had done by listening to it.

The President said that, in putting to the meeting the resolution which had been so ably supported, he must say they were all under a deep debt of gratitude to Mr. Corbet Woodall for coming and addressing them, and giving them something to think about. He was reading a little while ago that there was very little thinking done now in the Universities—most of it was done in the factories and workshops. Whether or not this was really true, he would not venture to say; but he would say that there was much more thinking in the workshops and factories to-day than there was formerly, and this thinking was done, not only that men might advance themselves, but to aid the industry with which they were connected. What was required was that they should think intelligently; and it was by listening to such an address as they had just heard that they received the help they needed.

The vote of thanks having been carried with acclamation,

Mr. Corbet Woodall, in acknowledgment, remarked that if any thanks were due to him, it was perhaps for having furnished the peg on which the interesting series of speeches which they had since heard had been hung. What Mr. Austin had said was enough to cheer and invigorate all in the room; and they were grateful to Mr. Browne for his good counsel. As to the length of his (the speaker's) connection with the gas industry, he was thinking the other day that he was probably one of very few left who were original members of the British Association of Gas Managers. He believed he attended the very first meeting, which could not have been far short of fifty years ago; and at that time he was already the Engineer of a gas undertaking. His retrospect therefore went back very far indeed. During his experience he had filled pretty nearly all the offices that went to make up the total service of a gas undertaking. Beginning at Woolwich as Assistant to his dear old friend Mr. Robert Morton, in a very junior capacity indeed, he had to be at the works at 6 o'clock in the morning; and he was quite sure he was none the worse for it. It had been a very sincere pleasure to him to be with them that evening; and he would only add to what he had said a word to this effect—that while one realized all the advantages that Mr. Austin had pointed out in connection with co-partnership, and the improvement in the outlook of the workmen and co-partners generally, he himself would be sorry to lay too much stress on the mere accumulation of a banking account. The question of character should be kept as prominently to the front, at any rate, as any other form of advancement; and on this point he need not lay emphasis, because he was sure it would commend itself to them all. If there was to be real and true success, there must be strenuous application. If they were not to be content with merely following in the rut, but wished to get out of it and make a name and a place for themselves, then even in their industry it must be done by using to the utmost the opportunities that fell in their way. Success did not come by luck or chance, but by real solid striving and work.

President of the Institution of Gas Engineers.

The President mentioned that Mr. J. W. Helps, the President of the Institution of Gas Engineers, had been particularly anxious to come and hear Mr. Corbet Woodall's address; but, unfortunately, another engagement prevented him from doing so.

The Transactions and a Dinner.

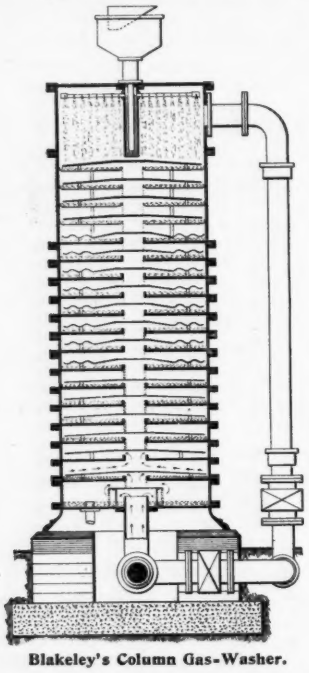
The President, referring to the printed volume of "Transactions" for the session 1908-9, said the members would remember that a copy had been promised to them without any extra charge beyond their subscription. But, unfortunately, the work had proved a little more expensive than was at the time anticipated, and financial considerations made it necessary on this occasion to charge 1s. a copy to the members. They would agree that the book was well worth the money; but still, in view of the promise made, this explanation was called for. He saw no reason why in future years copies should not be given to the members on payment of their subscription. It had been suggested that they should now and then hold "Coffee Meetings," at which they could freely and informally talk over things which they might not care to discuss in public; and if the members agreed with this, arrangements could be made. They did start such meetings at one time; and the Manchester Junior Gas Association had adopted the idea. Then as to a dinner. Last year, it would be recalled, a very satisfactory one was held; but it was not the wish of the Council to commit the members to any extravagance in the way of dining, without an expression of opinion. If the members approved of a similar function next spring to that which took place at the Horse Shoe Hotel last session, they might let the Council know.

At the close of the business meeting, there was an informal social gathering, at which light refreshments were served.

Boosting Gas Pressures.—We learn from "Engineering Record" that an installation of Westinghouse gas-engines for boosting the pressure in its gas pipe-lines has recently been contracted for by the Public Service Corporation of New Jersey. At the Hoboken and Passaic plants, four Westinghouse vertical, 13 in. by 12 in. gas-engines, equipped with special regulating mechanism, will be employed to drive direct-connected Root blowers delivering gas at pressures varying from ¾ lb. to 4 lbs. per square inch, as desired. The delivery of gas by the blowers is automatically made to conform to the demand on the pipe-lines, by increasing the speed of the engines as the pressure in the mains tends to fall. To accomplish this, a special controlling valve has been added to the engine equipment, which throttles the fuel admitted to the engine—adjusting its speed between 290 and 125 revolutions per minute, as the demand for gas varies. While it is estimated that the minimum demand on the lines will probably absorb the delivery of the blower at its lowest speed, any possible abnormal rise in pressure is prevented by the provision of relief-valves which automatically open a bye-pass round the blower, enabling the engine to run light while performing no other work than circulating the gas in its local circuit. The engines are each of 90 B.H.P. capacity, and use illuminating gas from the mains, with a heat value of approximately 600 B.Th.U. per cubic foot. They are direct-connected to the blowers through rope flexible couplings.

AN IMPROVED COLUMN GAS-WASHER.

We give below an illustration of a new form of gas washer or cooler which has just been devised by Mr. William Blakeley, of Messrs. Firth Blakeley, Sons, and Co., Limited, and for which he has applied for a patent. It can be utilized as a condenser, an ammonia or naphthalene washer, a water-cooler, or for other purposes. The principle upon which it is designed is the passing of a thin stream of gas over the surface of a liquid, whereby intimate contact is obtained, which enables any existing chemical affinity between the two substances to take effect.



Blakeley's Column Gas-Washer.

The apparatus, it will be seen, consists of a series of trays, one above the other, and forming a kind of still. Each tray is covered with a shallow depth of liquid; the depth being governed by a circular flange in the centre. An opening in the centre of the tray, of the same size as the inlet-pipe, is provided for the passage of the gas; and over each tray is fitted a deflecting plate to keep it at the proper distance from the surface of the liquid. The deflecting plates (though shown with a straight taper in the diagram) are made to a parabolic curve, to allow for the gradually increasing diameter, and so leave the area of gas passage between the plate and the liquid always the same. The gas, entering at the base, passes through the centre opening of the first tray; and its only way of escape is through the space between the deflecting plate and the liquid, and thus it goes through the entire series, finally emerging at the top. The action of the gas in passing over the liquid in the trays will be to cause a rippling of the surface, which it is anticipated will greatly increase the efficiency of the apparatus as a washer. To increase this rippling action, it is intended to make some or all of the deflecting plates with circular corrugations, as shown in the middle portion of the diagram; these corrugated plates causing a wave-like action both of the gas and the liquid.

When used as a condenser for coal gas, cold water will be passed in at the top; and as the gas enters at the bottom the process of condensation will be a gradual one, and regulated to any suitable temperature by the quantity of water put in. As an ammonia washer, the working would be the same; and by regulating the water or liquor supply at the top, any strength of liquor could be obtained from the base, exactly the same as with a scrubber-washer. In the case of its use as a naphthalene washer, for which it is considered to be eminently suitable, the washing oil would be regulated by a tap at the top, so that on the arrival of the oil at the base it would have done its full amount of work. When employed as a cooler for water or other liquids, the reverse operation to gas condensation would take place. The dotted lines in the diagram show the level of water in the trays, and how it overflows from one to the other. The second tray from the bottom is without these lines, to show how the feet are provided for each deflecting tray; there being three of these to each, and of the same length.

It is claimed for the apparatus that it will give very little back-pressure beyond that caused by the additional friction. This would enable it to be placed before the exhauster, and thus prevent a great deal of tar getting to the machine, which always causes trouble, sooner or later.

Mr. Hilliard Stephens, A.M.I.Mech.E., A.M.I.E.E., has joined the staff of the Davis Gas-Stove Company, Limited.

GAS-FIRES—A SEASONABLE COMMUNICATION.

The change from muggy weather to the cold and bracing state of the atmosphere experienced yesterday and to-day turns one's thoughts to the heating arrangements of dwelling-houses and business premises during the winter. Most appropriately, on this change to a lower temperature, a communication has been received, at these offices, from the Gaslight and Coke Company, addressed to the Editor of the "Journal"—not in that capacity, but as the occupier of the premises. Gas-fires have been the sole means of heating the offices for more years now than perhaps it is well to number, as it only reminds one of the flight of time. Under the circumstances, the communication (which is signed by the District Inspector of the Company) does not in this instance directly appeal; and therefore use may be made of it by reproduction in our columns. It will serve as a suggestion to others; it is certainly a model of what such a communication should be:

The Gaslight and Coke Company,
146, Goswell Road, E.C.,
Oct. 23rd, 1909.

Sir,—May I draw your attention to the many advantages of gas for the heating of business premises?

Gas-heaters give a cheerful, comfortable appearance to an office, make no work, no dirt or dust, can be lighted at a moment's notice, and can be put out the instant the premises become comfortably warm. They are therefore far better suited to our changeable climate than coal-fires or radiators heated from a central boiler.

The prejudice formerly entertained by some people against gas-fires is rapidly dying away, in view of the conclusive demonstration by medical and scientific men that they can be used with advantage rather than detriment to health, and of the satisfactory experience of their use by many thousands of our consumers.

If you are not fully satisfied with your present heating arrangements, will you permit me to call and discuss the matter of gas heating with you?

In the hope that you will do me the favour of seeing me on the subject, I am enclosing a stamped addressed post-card; and if you will kindly advise me thereon of a day and time that will suit your convenience for me to call, I shall be very greatly obliged, and you will incur no obligation whatever other than that of giving me a few minutes' hearing.

Awaiting the favour of your instructions,
I am, Sir, your obedient Servant,

.....
Inspector.

[Name and address of recipient are given here.]

On the back of the accompanying stamped post-card appears the following:

Date_____ 19_____

Please call on:—

(Name)_____

(Address)_____

_____

The most convenient time for you to call would be between the hours of_____and_____on_____day, the_____ or*

between_____and_____on_____day, the_____

*N.B.—Kindly give an alternative appointment. Every effort will be made to keep the first-named; and you will be notified if that is not possible.

In this connection, mention may again be made of the communications received by the consumers in the district of the South Metropolitan Gas Company in which were offers to clean gas-fires and replenish fuel free of expense; stamped post-cards being enclosed for acceptances of the offer. This is having a splendid effect in advertising domestic heating by gas-fires. Gas-fires are readily maintained nowadays; and a gas-fire well maintained in any house is an excellent advertisement for gas heating. We learn from consumers in the district that there is prompt reply on the part of the Company to the post-cards, that men courteous to the consumers and expeditious over their work are sent, and that the result of their light labour is complete satisfaction on the part of the consumer. In one instance within knowledge, an old type gas-fire was not giving satisfaction. The fire could not be brought to a proper frame of mind by the local gas-fitter. Friendly recommendation led to a communication on the subject with the Gas Company. Next day the difficulty was righted; the consumer was not troubled with an account from the Company for their services; and the consumer's household and the gas-fire in question have lived together happily ever since. Several other consumers have heard of this single incident from the consumer.

Mr. James Taylor, of Bakewell, for many years a member of the District Council, and a Director of the Bakewell Gas Company, left estate of the value of £18,239.

Among the awards of medals and prizes by the Institution of Civil Engineers for the year 1908-9 is a Telford gold medal to Professor B. Hopkinson, M.A., B.Sc., of Cambridge, whose writings on the gas-engine have been noticed from time to time in our columns.

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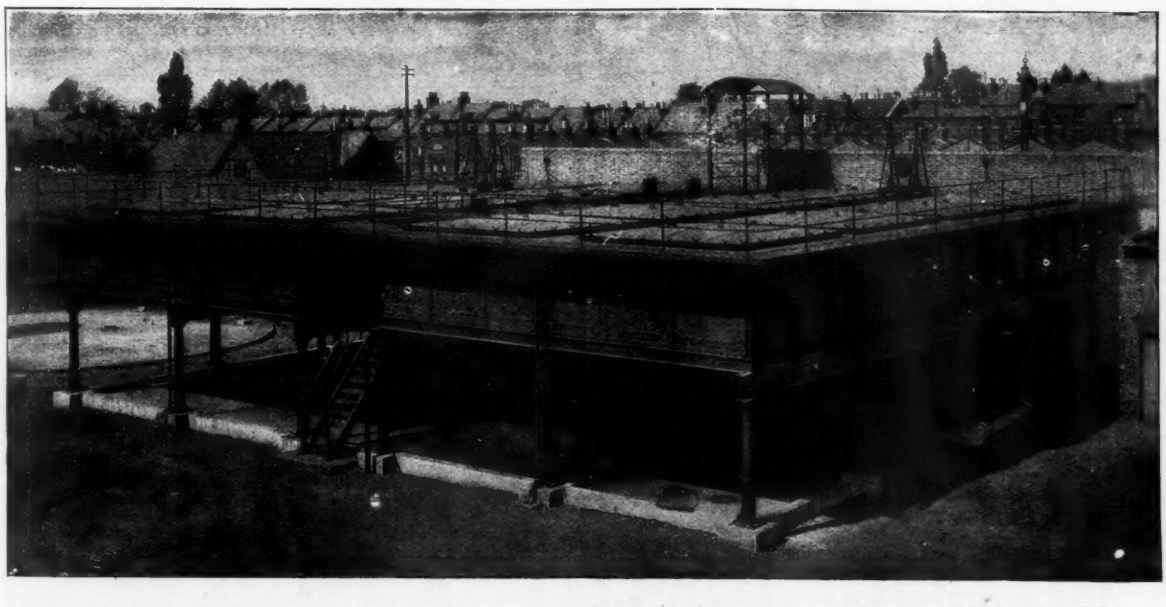

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Clun House, Surrey Street,

OCT 8 1909

London, W.C. 7th Octr. 1909

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Dear Sirs,

I herewith enclose cheque in settlement of account.

I am now fitting your gas-stoves, and they are all working satisfactorily. Some of them have been in use for ten or twelve years; and all I can say is that I would be sorry to go back to anything so troublesome as the coal-fire with all its attendant dust and dirt.

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PALATINE WORKS, WARRINGTON.

MODERN DEVELOPMENT OF THE GAS INDUSTRY.

At a Meeting of the Birmingham Section of the Society of Chemical Industry, held on Thursday last, at the Birmingham University, an interesting paper was read by Dr. W. B. Davidson, the Chief Chemist of the Birmingham Corporation Gas Department, who, in the short time at his disposal, gave a comprehensive survey of the present position of the gas industry.

After touching upon the work of Murdoch, Dr. Davidson remarked that during the past half century the development had been very striking; and to-day the proportions of the industry had attained huge dimensions. He said that, estimating roughly, in the United Kingdom 17 million tons of coal, of a value of £10,000,000, were used annually in gas making; 60 million gallons of oil were employed, of the value of £700,000; and 100,000 tons of oxide for purification, of the value of £120,000, were used. The gas sold was 200,000 million cubic feet, of a value of £25,000,000; and the residuals included coke, breeze, and dust, of a weight of 8 million tons, and a value of £5,000,000. Approximately 10 per cent. of the gas made was carburetted water gas. During the eighties and nineties, the rate of increase in the output of gas in this country was seven or eight times the rate of increase in the population; but naturally this extraordinary development could not be maintained for very many years, and the last decade had witnessed a considerable slackening in the demand for town gas. A table giving the output of 24 of the largest gas undertakings in the United Kingdom for the years 1888, 1898, and 1908, together with the decennial percentage increments, showed that the Metropolitan Companies were making less rapid progress than the Provincial undertakings; while London Suburban Companies enjoyed an abnormally high rate of increase. It was gratifying from the manufacturer's point of view that, in spite of economies in the consumption of gas for lighting purposes, the ever-growing competition of electricity for light and power, and the introduction of numerous producer-gas plants in large factories, the average rate of increase in the output of gas was still more than double that of the population.

Turning to the subject of gas lighting, Dr. Davidson remarked that with gas at 2s. 6d. per 1000 cubic feet, giving an efficiency of 20 candles per cubic foot, 1000 candle-hours cost, for gas only, 1·5d.; while with electricity at 3½d. per unit, and Osram lamps giving an efficiency of 0·90 candle per watt, the same amount of light cost, for electricity only, 3·9d. Street lighting and the illumination of large rooms was accomplished most effectively by high-pressure gas in burners of special construction fitted with strong mantles. There had been considerable development along this line during the last five years. It would have been much greater had it not been for the additional expense entailed by the erection of compressing plants for the different installations. When high-pressure gas was supplied from the gas-works in special mains such as were now being laid in Birmingham and some other towns, no extra outlay on the consumer's part would be necessary, and he would thus be able to derive immediate benefit; while the streets would have full advantage. The best type of high-pressure burner had an efficiency of 60 candles per cubic foot—that was, three times as much as ordinary burners. The pressure of gas required was 50 to 55 inches (water gauge), or 2 lbs. per square inch. The cost for gas only, at 2s. per 1000 cubic feet (assuming a lower price for gas in bulk), was thus only 0·4d. per 1000 candle-hours. To equal this figure electricity must be supplied with flame arcs (efficiency 3 candles per watt) at 1¼d. per unit. So successful had high-pressure gas proved itself for street lighting that electric arc lighting already installed had had, in a large measure, to give way to it. Berlin, which was looked upon as the foremost city in Europe in the matter of street illumination, had decided in favour of the inverted high-pressure gas-lamp; and it would appear that London was going to follow suit, judging from the fact that a deputation of the Streets Committee, after visiting and carefully examining the systems of lighting in some of the principal Continental cities, recommended in July last "that high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity with open arc and flame arc lamps should be installed." He thought this must be looked upon as a great victory for gas lighting.

As to gas-fires, he remarked that a thermal efficiency of 70 per cent. (half by radiation and half by convection) was probably more than three times as much as that of a good coal-fire. Gas of a net calorific value of 540 B.Th.U. per cubic foot, at 2s. 6d. per 1000 cubic feet, gave 18,000 heat units for 1d.; whereas coal of a calorific value equal to 14,000 heat units per pound, at 18s. 8d. per ton (1d. for 10 lbs.), gave 140,000 units, or eight times as much. On this basis, a gas-fire was more than twice as costly as a coal-fire. But, nevertheless, its convenience, cleanliness, and labour-saving advantages recommended its use to the average householder. With reductions in the price of gas and further improvements in the appliances, it was not too much to hope that gas-fires would be more generally employed in the future. Attention was next given in the paper to Mr. A. W. Onslow's work in the way of heating by high-pressure gas; to the employment of gas for cooking; to the prepayment meter system; and to the use of gas for motive power. On the latter head, the author remarked that some thirty years ago the indicated thermal efficiency of the best gas-engines was only 16 per cent.; whereas to-day it was 37 per cent. So multifarious were the applications of gas, that gas supply had become quite a science in itself, apart from gas manufacture. This had been recognized by the City and Guilds of London Institute, whose examination papers had been set year by year since 1907 in gas supply as well as in gas engineering—the latter being three-quarters chemistry.

One of the questions of the hour in the gas industry, said Dr. Davidson, was the quality of gas that was called for. A conference of German chemists had given an answer to this query, and, among other things, had expressed the opinion that tests of illuminating power were superfluous. He thought gas chemists in this country would not be inclined to agree with this. "In the use of town gas," he continued, "a luminous flat or round flame is sometimes absolutely necessary; and as the manufacture of a non-luminous gas of the required calorific value is not an impossibility, it is advisable to stipulate an easy standard of (say) 12 candles with the No. 2 argand burner. By the way, this burner is not the very best obtainable. The Grafton burner of similar type is slightly better. Either will suit the purpose, however."

Under the heading of gas manufacture, reference was made to the various efforts put forth by engineers to reduce costs. One of these was working with smaller retort charges or lengthening the period of distillation, which gave a greater yield of gas per ton of coal. But labour costs increased; and this method was not to be recommended. A higher temperature of distillation afforded ready means of increasing the output of gas, and had been quite generally resorted to. Heating by means of producer gas generated in the retort-house and the use of the regenerative effect instituted by Siemens came into general use twenty years ago. In this way, not only was the yield of gas increased, but the consumption of fuel was greatly diminished. There were, however, some disadvantages. Capital and maintenance charges were both largely increased; and naphthalene made its presence felt. Two or three reliable remedies for the latter trouble had, however, been discovered. Another difficulty which became intensified was stopped ascension-pipes; but this had been overcome by various devices. Then as very high temperatures were attained, the defects of fire-clay material became a source of considerable trouble; a portion of the retort-setting not infrequently giving way. Greater attention had therefore to be given to the quality of fire-clay goods used; and steps had already been taken by those interested in the fire-clay industry with a view to improving and standardizing refractory material for use on gas-works. A combination of large charges with high temperatures represented the acme of perfection of modern methods of carbonization. Under similar conditions of temperature and exhaust, the make of gas per ton was not so great in this case as with smaller charges, but the quality was decidedly better. The effect of putting a large charge into the retort was to diminish the free space above the coal, and to lessen the degree of degradation of the hydrocarbons to carbon and hydrogen. The carbonizer found he could use more exhaust in order to bring the gas down to standard; hence the prevalent erroneous idea that heavy charges gave a larger yield of gas per ton of coal. An analysis of the gases would show an increase of nitrogen. Again, manufacturing costs had been greatly reduced not only by higher production of gas, but also by new machinery.

Inclined retorts, vertical retorts, and chamber ovens were then touched upon by the author, who gave the following as a rough comparison of the carbonizing costs (charging, drawing, and firing) per ton of coal for the different systems: Hand labour, 36d.; old machinery, horizontals, 18d.; inclined retorts, 12d.; new machinery, horizontals, 8d.; verticals, 4d.; chamber-ovens, 2d.

The final portions of the paper dealt at large with the progress made in the production of residuals, developments in purification, new appliances, and research work. On the latter point, Dr. Davidson said to his audience: "I would remind you of the bold experiment made by the Birmingham Corporation Gas Department in erecting five years ago, as a test plant, a complete gas-works carbonizing 24 tons of coal per day. Hitherto we have not published any results. I may confidently say, however, that the remarkable improvement in the carbonizing results of the different works of the department is in large measure attributable to the test works, and justifies the considerable expense in erection and working."

At the conclusion of his paper, Dr. Davidson showed several lantern slides illustrating various plant and machinery used on a gas-works. He had also arranged on the table an interesting display of up-to-date appliances, including recording calorimeters, the Féry radiation pyrometer, inverted gas-fittings, the Keith high-pressure lamp, &c., in which the members appeared to be greatly interested.

A short discussion followed, in which the President (Dr. Price, of the Birmingham Municipal Technical School) invited Dr. Lessing to take part.

Dr. Lessing stated that he thought the applause they had accorded Dr. Davidson was a proof of the value of the institution of this type of lecture (which was the second of a series recently started by the Birmingham Section dealing with each department of the industrial side of chemistry). He did not think that those who inaugurated the system ever expected to get a better class of lecture or lecturer than they had had that evening. Dr. Davidson had given them an extremely good survey of the present state of the gas industry in all its varied branches. He did not think

anyone could have done it better, certainly not in a more concise form, than Dr. Davidson had done. Those of the members who were not connected with the gas industry would have gathered from what they had heard how extremely important the services of the trained chemist were in this industry—a fact which was beginning to be recognized nowadays, as it ought to have been in times gone by. As Dr. Davidson had mentioned—and it was a remark that he thoroughly agreed with—gas engineering nowadays meant to a large extent gas chemistry. They had heard in the course of the paper that the Corporation of Birmingham had recognized the value of the services of the chemist by installing an up-to-date central laboratory and coal-testing plant; and the improvement in results which Dr. Davidson had shown to be effected after the experience gained by scientific and practical experiments on a fairly large scale, indicated the wisdom of their policy. He had had the pleasure of inspecting the testing establishment at the Saltley Gas-Works; and he did not know of any other gas-works laboratory that was better equipped—certainly none better conducted—than the one in Birmingham. The members would have gathered how varied were the duties of the gas chemist, and how manifold the problems he was confronted with. The apparatus they saw on the table was, to a large extent, used in connection with gas supply only. The carbonization of coal was, as indicated by Dr. Davidson, still in its infancy. Very little was actually known of the chemistry of it; and comparatively little had been added to their knowledge concerning it during the period reviewed by Dr. Davidson. This was where, in the future, a lot was expected from gas chemists and from establishments of the kind that Dr. Davidson now had under his control. The difficulties in connection with research of the kind were, of course, enormous. They would agree with him when he reminded them that the chemical reactions which had to be ascertained took place in rapid succession at temperatures of 1200° and 1400°. The difficulties seemed, indeed, beyond even the modern well-equipped chemist. They were, however, getting nearer; and the invention of new carbonizing plant of different types would certainly help them a good deal in clearing up matters. A movement was started in the gas industry a few years ago to try and scrap the old and well-tried plant altogether, and adopt new appliances, which should be first of all labour saving and overcome other difficulties that were met with in the older types of plant. So far, success had certainly been attained, although the new types had not yet been generally adopted—one reason being the fact that they had not yet overcome all the "infantile diseases." The capital outlay necessary, too, was, under certain conditions, almost prohibitive. Enormous progress had, however, been made; and it was only to be hoped that they would soon be enabled to solve the various intricate problems they had to face. A paper of the type they had listened to that evening would do very much in not only diminishing the interest of outside chemists, but in giving those in daily contact with problems of the kind an excellent point of view from which to survey the situation at the present moment, judging from it the probable course of development.

A vote of thanks to Dr. Davidson was proposed by Mr. SILVESTER (Public Analyst), seconded by Mr. BATTY (Chemist at the Erdington Nickel Works), and carried with acclamation.

Dr. DAVIDSON suitably responded, and replied at the same time to various questions which had been put to him by one or two of the speakers.

Crystal Palace Old Students' Society.

At the annual general meeting of this Society on the 13th inst., the Council's report on the work of the past year was read, and the report and statement of accounts were received and adopted. They showed that financially and socially the Society made excellent progress during the last twelve months; and although the membership has not increased, the interest of the members has been universally revived to a very marked extent. The principal cause of this has been the concentration of the work at the new headquarters, No. 54, Parliament Street, Westminster, and the personal interest shown by the Hon. Secretary (Mr. Percy Griffith) in each member. The Council and officers for the year 1909-10 were elected, and the new President (Mr. H. C. H. Shenton) delivered an interesting address. The annual dinner was held at the Criterion Restaurant the following evening—the President in the chair. The occasion was marked by the presence, as guests of the Society, of a large number of distinguished honorary members, including Mr. Charles Hawksley, a Past-President of the Institution of Civil Engineers, Mr. A. T. Walmisley, the Engineer to the Dover Harbour Board, and Mr. T. W. Wilson, the Principal of the Crystal Palace School of Engineering. Mr. Hawksley proposed "Success to the School;" and in acknowledging the toast, the Principal supplied interesting records of the work accomplished by old students after leaving the school. It may be mentioned that the position and prospects of the school are entirely unaffected by recent financial difficulties of the Crystal Palace Company.

"The Patent Road to Fortune" is the title of a booklet by "A Successful Traveller on It," which Messrs. Burtt Bros., of Hull, are publishing at the price of 3d. net. The author begins by indicating what to invent, and then goes on to show what to do with an invention. If the following of the advice given should lead a reader to the goal the author has reached, he will not have reason to regret the outlay of a few pence to obtain it.

NOTES ON INCOME-TAX AND ASSESSMENT.

By GEORGE HELPS.

[A Paper read before the Midland Association, Oct. 21.]

Having been asked by your Committee to give a paper on the above subject, I beg to submit my remarks for your discussion.

INCOME-TAX.

There is no necessity to go into the history of income-tax, but simply to deal with the administration of the law in complicated questions of fact so far as gas-works are concerned. Income-tax is a tax sometimes levied on capital and always levied on income; but I must refer you to the Income Tax Acts for what is taxable income and what is not. The one question in connection with income-tax that affects all of us most is that of depreciation.

It must be very certain that everything connected with a gas-works depreciates, and that this depreciation has to be made good or allowed for before net profits can be arrived at. If a gas-works be taxed on receipts *plus* depreciation, there is something wrong with the Act of Parliament or the administration of it, or even those responsible for the control of the gas-works.

How do most of us allow for depreciation? Is it our custom to charge every alteration and extension that is made wholly to capital, or do we, to arrive at the figure for depreciation, give a life to every different part of our plant and apparatus, and depreciate it every year according to that life? We know very well that we do neither of these things. To charge every extension to capital would be as ridiculous as it would be to attempt to depreciate the thousand and one parts which go to make up our whole system on the basis of an average life. What becomes of the average life basis when obsolescence throws plant out of use? I submit it is only theorists who ever dream of talking of such accountancy. In an ordinary way, I can understand no repairs and maintenance account that does not include renewals. The practice, to put it shortly, is that we charge, or we should do, all that we reasonably can—observe, please, I say reasonably—to the expenditure on new works and extensions to revenue, to cover the depreciation which we know is going on all round; and so that we do not overstep the mark either way, we are supposed to keep our eye on the balance-sheet value of the undertaking (the face-value, as it were) and the actual value as represented by the plant both inside and outside the works, and independent of preliminary expenses and goodwill.

Of course, it may be reasonably argued that where a works is absolutely at a standstill—where no extensions are being carried out, where no new customers are being supplied, and where for some reason or another nothing in the way of general repairs to plant happens to be required for a particular year—then an allowance for depreciation which later would arise is undoubtedly called for.

Take meters alone. I can imagine a works scrapping a few thousand meters and putting in new ones in their place. The whole of the new meters would be chargeable to revenue; and if one year would not stand the charge, then the amount could be spread over several years by means of a suspense account. The Income-Tax Authorities would allow this to be done. I do not, however, see why a gas company should grumble when, after several thousand meters had been put in—which, of course, would not require any repairs for several years—the taxing authority would not allow depreciation on those meters to be set aside every year to build up a sum that would pay for the renewals when they again came along, and I do not think we as business men should ask them to do it.

Now supposing the meters purchased, instead of replacing old ones, were for all new customers, then the sum of their cost would be rightly chargeable to capital. In such a case, I should say there would be a very good reason to ask for an allowance for future depreciation year by year, provided the whole of the meters of the particular gas undertaking were kept in such account form that the authorities could see very clearly that the depreciation asked for would not in time reach a greater figure than the original cost of the meters. Herein lies the difficulty which we ought to recognize that taxing authorities have.

Again, consider the position of an absolutely new works put down complete in a town where there has been no gas before. Obviously, to commence with, there would be no repairs, &c., account that would cover the depreciation of the new plant, &c., taking place for the first few years. Should not then depreciation be allowed for here? I admit there would appear to be a reason for some allowance. The local rating authorities would allow for reasonable depreciation; but what would happen with the Income-Tax Authorities is not so certain. The reason for their attitude, whatever it is, must be looked for in the knowledge they possess of gas-works' accounts and management. They know what gas-works have done—gas-works which were once new—and perhaps they think they are entitled to receive a little more than their due when they have such an opportunity.

Rating authorities to-day have a pretty good insight into the manner in which various industries keep their accounts. They know that where one man would make a justifiable claim for depreciation, twelve would make unjustifiable claims.

Apart from the two examples given, it will be generally admitted that, in an ordinary way, if a gas-works has been in operation for a number of years the repairs in all departments vary very little

from year to year, and any serious variation can be covered by a suspense account, which all rating authorities, I understand, will accept, if satisfied that the circumstances warrant it.

Some of the letters which have recently been appearing regarding income-tax assessment, seem to convey the impression that the authorities are endeavouring to tax more than the actual income in the case of gas-works—that is to say, that they will not allow depreciation. I have seen nothing in the circulars or letters from the authorities referred to that conveys to me any such intention.

The positive proof of whether depreciation has been properly allowed for or not, can only be found by making a valuation of any works at the present time and comparing it with the face or balance-sheet value. Further, if it be found by such valuation that the capital per million cubic feet sold has been going up over a considerable period, and that in fact the balance-sheet value shows a far greater sum per million sold than a modern works could be put down for complete in every detail, then those responsible for that gas-works have probably been paying profits out of their capital account at some time or other. I am excluding, of course, the effect of watering capital.

As all the trouble of rating hangs around this question of depreciation, whether the tax be imperial or local, there is no necessity for me to divide my remarks further as to the imperial and local taxes.

Local Rates.

That many gas-works are unduly rated, there is no question. That not a few are under assessed is also true.

The former are often afraid to tackle the complexities of rating; and the latter—well, are lucky in the Assessment Committee with which they have to deal, or in the tribunal before which they may have carried an appeal.

The source whence emanate the deprecatory remarks on rating is not difficult to discover. Rating is a subject that is not often written about, and one which is probably less understood than any other case of expenditure appearing in gas-works accounts. Thus we often hear that—

1.—The law is bad concerning it.
2.—The people who support Unions and others in applying the law are rogues and worse.
3.—The Bench before which a case is heard is generally ignorant.

Now, in my opinion, all these are fallacies. It is one thing to say the law is bad, but quite another to discuss its bad points and definitely suggest amendments that would improve it. I have studied the matter for some years from a standpoint—the side of the taxing and rating authorities—that we concerned with the industry should study it. I have come to the conclusion that gas undertakings have no reason to wish the law altered. We all know that the law is bad—all laws are that we like to avoid; but it certainly has this to recommend it, that, having been in operation for so long, those who set out to become familiar with its working may hope to do so to a reasonable extent. Let us rather seek to have the present law well administered. A bad law well administered is better than a good law badly administered. A new law would more than likely hit us in unexpected places.

There are two aspects from which our rating may be studied.

A.—One aspect is that presented by a consideration of the rating of one gas-works compared with another.
B.—The other aspect is that presented by a consideration of the rating of gas undertakings generally as compared with other industries and trades.

I do not propose to deal with rating generally—it would be a task too profound for the purposes before us to-day. It will be well, however, to refer to our chief competitors—the rating of electrical undertakings. If such undertakings be paying a rate of a less sum per co-efficient of 1000 cubic feet of gas than the 2d. or so that we gas companies are paying, it is unfair to us, as it would give our electrical friends an undue advantage.

In judging, however, any case that crops up as between the light and power industries and others, it must be borne in mind that most of the undertakings supplying light and power have special Acts of Parliament; special rights in connection with roads; and other special privileges that do not obtain with all industries.

I have said that many gas companies are over-rated. In this I know you will agree. I will now endeavour to show what is in my opinion the chief cause. In a word, accounts. I wish to discuss the matter on broad lines; but I will promise to get down to such detail as any one may care to provoke in discussion.

Rates still, I think, are calculated on the net income chiefly, although a good many issues have been raised on tenants capital only; the rent a hypothetical tenant would pay being considered to depend on the income that the tenant in possession can make. The income is affected, if not principally, very largely by the manner in which capital and revenue charges are allocated. Let me call your attention to a few facts in connection with capital. Take, for example, works having more or less the same output of gas which have been working for the same number of years, and which are owned and watched over by a Board of Directors in each case and each having the services of an Engineer and Manager. It is no startling news for me to point out that in one case the capital may be round about £300 per million cubic feet sold and in another £1500 per million sold. I have analyzed the capital accounts of over fifty gas companies.

I take fairly extreme cases. It is pretty certain that a works with the less sum per million sold has been reducing its capital by very liberal charges—charges in my opinion unreasonable—to revenue, thereby showing a far less income for rating than in fairness to the rating authority and other ratepayers it ought to have done. Can such a company expect its balance-sheet figures to be accepted? I can imagine a good many of you saying, "Nonsense, absurd, it's everybody's duty to keep capital down, it would ruin the best of businesses to act in any other way," and so on. I agree that all this is perfectly right so long as the landmarks of reason are respected.

We here are doubtless satisfied that rates are necessary, and that gas companies have the privilege of paying them as well as other companies and persons. It will be also admitted that those people whose privilege it is to pay rates, wish to pay as little as possible. If all ratepayers evade payment in the same proportion, little if any injustice would be done. Where, however, a ratepayer or a collection of ratepayers makes, or causes to be made, false entries in their books, to deliberately show far less profits than are actually made, and thereby are assessed to pay less rates than they should pay, under what category in morals does such an action come?

I have referred to capital per million cubic feet of gas sold as varying from £300 to £1500.

I have no desire to split straws as between capital and revenue charges. I believe in the capital shown in the balance-sheet being amply represented by up-to-date plant in good order at the works, and mains, meters, &c., in good order in the district, thereby allowing distribution to be effectively done at proper pressures, and customers to have all the gas they desire. But I do not believe in capital value of plant, &c., being twice that represented in the balance-sheet.

Now let it be considered what the effect is when this extravagant charging to revenue referred to takes place, and what bearing it has on the question we are dealing with. Why is extravagant charging to revenue illegal, unjust, and immoral? Because:

1.—It withholds money from the present shareholder and stores it up for the future shareholder.
2.—It causes an undue charge to be made on fellow ratepayers.

If a gas company making 20 per cent., after fairly allocating its expenditure as between capital and revenue. prefers to pays its shareholders only 10 per cent. and put the other 10 per cent. into new plant, is the present shareholder receiving what he is entitled to? How many of us here would submit to such an arrangement were our own money concerned, unless we had some set-purpose in view?

The ordinary lay shareholder does not know that his shares are worth considerably more than they are fetching in the market. The Directors know, however, and sometimes are tempted to act accordingly, and buy up at low rates at the expense of the people who have given them their trust. Any action that puts the few shareholders in possession of knowledge that is withheld from other shareholders, must be wrong. The proprietors of the concern are the joint and not the several shareholders. Further, even if all the shareholders knew the true position, those who at any time wished to realize on their shares, would not be likely to obtain their value, because the interest their investment was actually earning would be hidden in the published accounts. If the matter be looked at from this point of view, there will be found very little that is rational in the too unwisely hoarding-up of value in the undertaking for those who come after to reap the benefit.

Some people who in ordinary business would scorn a man who robbed another in the ordinary straightforward general method of robbery, do not hesitate to rob their fellow ratepayers—incidentally their fellow shareholders—of huge sums in some such manner as I refer to. There are gas companies with hundreds of thousands of pounds which have never figured in the receipts. A private individual is justified in keeping his accounts as he likes; but public bodies are not. Cases could be cited where Directors have drawn on revenue to such an extent as to pay shareholders 2½ per cent. when the earnings have been 10 per cent.; and the effect of this has been that they and their friends have been enabled to buy up the shares at less than one-half their value—in fact, cases are known where 15 per cent. has been earned and yet a loss of 5 per cent. has been shown in the statement of accounts. Directors may be quite justified in arguing that if the capital is kept down in this way, should a bad time come and competition in artificial lighting become very keen, they would be able to hold their position. But it is submitted that the only legitimate manner of providing for such a contingency is by the formation of a special fund, which provision alone allows all shareholders to know—what they are entitled to know—the true position of their business. Such remarks as these may be considered as suggesting the attainment of too high a standard in company government; but such an argument will surely only serve to emphasize their justification. It is difficult to state with mathematical exactitude what constitutes dishonest representation; but there can be little doubt that such a stage is reached when a section of shareholders are (purposely or otherwise) deceived by accounts being manipulated to anything like the degree that has been here described. And if shareholders, then rating authorities.

It is a very simple matter to discriminate between capital and revenue; and the safeguard is to check from time to time the

face capital value as shown by the valuation of works, plant, and mains. There are many ways of doing this with quite reasonable exactness. The bearing that these matters have on rating will I trust be obvious. If accounts are properly kept, few gas companies will have any trouble in convincing the various Unions as to their rateable value. On the other hand, falsify—there is no better word—in some manner, and you must not grumble if the Unions put your rates up to figures that the face of your balance-sheet does not appear to warrant. Some Unions are not too partial to the face profit gas companies show. They like to go to the heart of things a little.

I need not deal with the effect of works management where the capital has to stand all the charges, in some cases to provide the profit.

So far, I have dealt with depreciation. Among other matters that affect rating one of the chief causes of discontent with gas companies to-day is the effect of the slot business and tenants capital generally. Many gas companies claim that, on account of the excessive tenants capital required for the slot business, &c., their assessment should become less and less in spite of increased profit in their business. It is well known that in rating an allowance is made for interest or profit on the tenants capital, which profit is not rated; and it is the amount of this allowance around which so much controversy rages.

There are gas companies who boast of charging all their slot capital to revenue, thereby reducing the net profit earned with all sorts of items of tenants capital charged out at the highest prices that their abnormal appetites for unfair gains allow them to think reasonable, and who expect on these sums to be allowed 17½ per cent., and so reduce their rateable value by such amounts. Is it very much to be wondered at that these practices are not always successful?

Gas companies wishing to have a reserve fund can probably have one as big as they care for by paying the taxes on it.

Discussion.

The PRESIDENT (Mr. W. Langford) confessed to a feeling of disappointment at the manner in which the subject had been treated, because, in the main, of its one-sided character. Mr. Helps wanted to show them, as representatives of the gas industry, that they had nothing to complain about; whereas they had long felt that there were inequalities, not to say evils, which required redressing. This, in his opinion, was the *crux* of the whole matter. He took it that the question of depreciation was a burning one with gas-supplying authorities, especially in the light of recent legislation and the circular issued by the Inland Revenue to Surveyors of Taxes. Those present were, no doubt, aware that this circular specified that no depreciation should, under any circumstances, be allowed with respect to the plant and machinery of gas undertakings; whereas instructions were issued simultaneously to these officials with regard to electric light stations, that, "in addition, a reduction allowance for depreciation may be granted at the rate of 3 per cent. on the written-down value; and on their plant exclusive of loose tools, meters, and office furniture, at the rate of 5 per cent. per annum on the written-down value, in addition to the cost of repairs." As members of a Gas Engineers' Association, it was for them to consider how to secure a redress of the inequalities which existed; and the question arose as to the best way to obtain what they desired, in the interests of the industry in which they were engaged. They had a parent institution—the Institution of Gas Engineers—and they looked to it in times of trial and difficulty; and he thought rightly so. The only question for them, as an Association affiliated to the Institution, was one of ways and means. He was afraid the Institution had not the necessary funds; and he thought the members ought to see if they could not get their Chairmen and Committees to be a little more liberal towards some central agency that could deal with these matters. He had spoken on the subject to his Chairman, who had indicated that, if it could be shown how these inequalities could be dealt with by such an organization as the Institution, they would be willing to contribute. In the discussion which was to follow, he hoped they might arrive at some solution of the question of how joint action could be taken to remedy the grievances they had to complain about.

Mr. H. J. WOODFINE (Wellington) remarked that he did not quite understand what was meant in regard to renewals from what the President had quoted from the instructions issued by the Board of Inland Revenue.

The PRESIDENT said that by the instructions expenditure on repairs and renewals, including extensions and improvements, was, in regard to gas and water undertakings, to be charged and allowed as working expenses, "as and when incurred."

Mr. R. O. PATERSON (Cheltenham), like the President, had also to express disappointment at the paper, because he thought the writer had not gone to the root of the matter in the way he might have done. There was a great deal with which he entirely disagreed, and one feature to which he took serious exception. He did not think the members of an Association like theirs—officials of gas undertakings—should criticize, as the writer had done, the actions of their masters, their superiors, their employers. The paragraphs in the paper to which he objected were those beginning: "Why is extravagant charging to revenue illegal, unjust, and immoral," down to the end, because he did not think these should go forth to the public as emanating from the Association. Such expressions would do them no good. He did not question the right of the author to his opinion; but he thought it would have been better had the paragraphs referred to been expunged by the Committee before presentation to the meeting. There was no doubt gas companies and those in charge of municipal gas undertakings had grievances on this question of the allowance for depreciation granted them, as compared with those for electric light undertakings; and he thought there was room for a great deal of argument on this point, and the need for redress. On the question of local rating, he was of opinion that Mr. Helps hardly cleared away the difficulties for them, and had left them very much where they were. At the same time, he did not think there was any great difficulty, as the Gas-Works Clauses Act gave plenty of scope in the making up of their accounts—sufficient to cover the expenditure, including renewals.

Mr. J. FERGUSON BELL (Derby) also expressed disappointment at the manner in which the whole subject of the paper had been treated. He thought that Mr. Helps had gone out of his way to attack gas companies and their directors. His experience was that the companies made out their accounts fairly; distinguishing between capital and revenue. He believed they were anxious to do that which was fair, just, and right. There were, of course, anomalies—some companies paying between 3½d. and 4d., and others as low as 1½d. and 1d. This showed that there was something bad in the way the law was administered; and no doubt there were a great number of gas companies who were not fairly treated by the Assessment Committees. If an appeal were made to Quarter Sessions, they were not much better off, because it was really a local Bench of Magistrates. There was no doubt in his mind as to the necessity for an alteration in the law in regard to the assessment of gas companies. He did not agree with the suggestion that gas companies were anxious to get out of their statutory obligations; on the contrary, he believed they were quite willing and anxious to do what was reasonable in regard to the rates.

Mr. WOODFINE said that if electric light undertakings were to have the advantages mentioned by the President, gas undertakings were certainly going to be worse off; but he did not think this could be the case. As to the points raised in the paper, his experience with the income-tax authorities was that gas companies were not allowed to charge to revenue anything in connection with new works and extensions without being taxed. Every year he received an inquiry as to whether he had improved the works; and this implied that if he had done so he was going to be taxed to the amount spent in improving them.

Mr. VINCENT HUGHES (Smethwick), as one responsible for Mr. Helps being asked to contribute his paper, felt, after what had been said, that he ought to apologize. In Mr. Helps they thought they had a champion who would take up their case. They looked upon him as a sort of Balaam, and sent for him to come and "curse these people" as they were "too mighty." But behold, Mr. Helps had blessed them. (Laughter.) And now there was grumbling because they found this Balaam had not quite fulfilled their expectations. (Renewed laughter.) It seemed that if they took him to the top of another hill, he would curse them from there. He (Mr. Hughes) had been thinking that probably on the journey an angel had spoken to their friend. If so, it did not seem to have impressed him much. (Laughter.) Proceeding, after the merriment had subsided, Mr. Hughes said he was quite sure that in what Mr. Helps had said he had no intention of being offensive to the directors of gas companies, or to anyone else. To have adopted the course suggested, and expunged from the paper the references alluded to, would have been most unusual; and he ventured to say that it had never been done before. As to what had been said about rating, he believed gas undertakings did have a grievance, especially in local rating. They were supposed by a good many people to have a monopoly; and this was probably the cause of their grievances. He did not agree with the idea of their having a monopoly. They had very strong competitors in many directions; and he was not so sure that in local rating their electrical friends were very much worse off than they were. He thought the system of rating as fixed was altogether wrong. Why should large undertakings, with a capital ten times as great as theirs, employing ten times the number of men, and making a greater amount of profit, be assessed at an infinitely lower figure than they were themselves? It was all because they were believed to have a monopoly. This was the cause of it. But they had no monopoly. If it had been a question of taxing light, the case was different. They would have to deal then with petroleum, candles, and other kinds of lighting. He wished Mr. Helps had pointed out the way to salvation for them; and if, in reply, he could give them some satisfactory answer, they would all be much obliged to him.

Mr. E. ALLEN (Liverpool) said it was a matter of regret that the writer of the paper had failed to satisfy those who had spoken. Mr. Helps had had an opportunity; but he had championed the rating authorities more than he had done the gas undertakings. No doubt many of them deserved the criticism Mr. Helps had indulged; but it seemed rather hard that the whole gas industry should be pilloried because of the misconduct of a few directors of gas undertakings. What he hoped to have heard was more with respect to the question of valuation. No doubt the law as to assessment was not what it should be. That it should be left to Poor Law Guardians was, in his opinion, an improper thing. As a rule, the Assessment Committees procured a surveyor whose object was to bring in as much money as possible; and the surveyor generally went as far as he could without provoking an appeal. In some gas undertakings the burden was growing, and there was a

feeling that something ought to be done. With reference to the President's remarks about the parent Institution dealing with this matter, he desired to point out that the Gas Companies' Protection Association already had it in hand. At the last meeting of the Committee, Mr. Joseph Cash, of Brighton, was before them giving evidence on this particular subject. It was felt that the recent circular issued by the income-tax authorities was not fair to gas undertakings. As to how far there should be joint action, and what form it should take, he was not prepared to say; but it was evident that something should be done with respect to the matter. To him, it seemed wrong that they should in any way assist those who looked upon gas undertakings as being their lawful prey.

Mr. HELPS, before proceeding to reply, said he desired to emphatically deny having any intention to give offence to directors of gas companies or anyone else. With all respect, he thought the gentlemen who had spoken on this subject had not quite grasped what he had written. Perhaps it was because he had not expressed himself so clearly on the point as he might have done. At any rate, he had endeavoured to do so to the best of his ability. Some speakers had said they were disappointed with the paper. On his part, he was disappointed with the discussion. Not a single point in the paper had been touched upon that he thought would have raised a discussion—in fact, the main one had not been referred to at all. One speaker said he did not tell them anything new, and had not referred to the instructions issued by the Inland Revenue Authorities. He (Mr. Helps) had stated that everything connected with a gas-works depreciated, and that this depreciation had to be made good or allowed for before the net profits could be arrived at. This was what he set out to convey to them; and not one of the speakers dealt with this subject as he expected they would do. He had said that charges for repairs and maintenance included, and must include, depreciation; and he had stated that he could not understand any maintenance account that did not include renewals. The figures he had laid before the members proved his case absolutely—that an undertaking having a less sum per million cubic feet of gas sold, had been reducing the capital by making liberal charges to revenue and so showing a far less income for rating than should be shown. The members should consider the matter from the other side; and this was what he had done in dealing with the question. He had been very careful in getting out the figures and in analyzing the capital accounts of more than fifty gas companies; and when he repeated that in one case the capital was somewhere about £300 per million cubic feet of gas sold, and in another £1500 per million feet, those present must surely recognize that his assertion was correct. It was very simple, and in his opinion unanswerable. He asked them to consider this question on broad lines. They could not set out to depreciate a chair, a desk, &c.—they must take the whole thing; and the rating authorities, as a rule, would allow reasonable depreciation. Mr. Bell said gas companies had no desire to get out of paying what they should pay. He (Mr. Helps) did not agree with him. There were gas companies who did not want to pay any more than they could help; and it was for the rating authorities to see that they did pay what they ought to do. In conclusion, he again expressed his wish to remove the impression that there was any desire on his part to reflect on the directors of gas companies.

SOME ASPECTS OF RECENT COMPETITION.

By W. J. RENDELL BAKER, of Malvern.

[A Paper read before the Midland Association, Oct. 21.]

It has been my pleasure to be connected with the Malvern Gas and Electricity Undertaking, as Engineer and General Manager, for the past five years. I have from time to time been asked for information by our members on the points contained in the following notes; and the few remarks enumerated below will, I hope, prove of interest to the Association and its members in dealing with the subject of the competition of carburetted air, electricity, and coal gas.

CARBURETTED AIR.

There are various forms of apparatus of this class of lighting on the market; the one that I have met more particularly being the "Litz." The "Litz," or the old Economic Company, I am given to understand, were one of the early makers of this class of lighting plant. The apparatus is manufactured in Malvern; and no doubt you are all aware of the type of machine that has been shown in various towns, at exhibitions, &c. The carburettor consists, briefly, of a small hot-air engine heated by its own gas, and a small rotary blower, which introduces a current of air into a chamber fitted with a number of tubes lying in petrol, the depth of which is controlled by a special valve. The petrol is supplied through a reservoir fitted on the same base-plate. The gas is sent through a small container or holder; the bell acting as a governor and controlling the air to the gas-valves, and in this way governing the speed of the engine according to the requirements of the supply.

From particulars I have been able to obtain through the courtesy of Mr. C. C. Broad, the proprietor of the Litz Gas Company, I am informed that, with their special burners, samples of which I have here, they obtain from spirit having a specific gravity of ·690°, 1250 cubic feet of carburetted air. The consumption of the burners is as follows: Upright burner (mantle 2⅜ in. by ½ in.), 7 cubic feet per hour; with the ordinary size inverted burner, 12½ cubic feet; and with the small or bijou type, 7 cubic feet. With this apparatus a special adaptation of the ordinary burner has to be carried out.

The later machine is of a weight-driven type, and enables users to take advantage of the ordinary incandescent burners; the burner being supplied by the petrol vapour from the machine and taking its supply of air in a similar manner to coal-gas incandescent burners. The make of gas with the latter form of apparatus is much lower than with the earlier type of machine; being equal to only 500 cubic feet from one gallon of spirit. The consumption, however, is much lower with incandescent burners. From tests that I have made with the later form of apparatus, the consumption is as follows:

Ordinary Bray upright burner	6 feet
Bray inverted	6 ,,
Bray inverted bijou	2 ,,
Graetzin burner	6·5 ,,

From the foregoing, the consumption is approximately 100 per cent. more than coal gas; and I venture to think that coal gas stands quite safe from any competition as regards costs of such a system. The cost of the carburetted gas, with petrol at 1s. 2d. per gallon, can be taken as 2s. 4d. per 1000 cubic feet; and since the amount of gas required is approximately double the consumption of coal gas with the inverted burner, it resolves itself into the question that coal gas must exceed 4s. per 1000 cubic feet to be in any way affected from this class of competition, and also the fact that with all self-contained plants of this description a consumer has not got the reliable source of supply as is obtained from a coal-gas works.

The heating value of carburetted air is given as equal to 280 B.Th.U. I have not had the opportunity of testing the calorific value; but from Mr. Fowler's paper, his report was 90·85 B.Th.U. Even with 280 B.Th.U., however, the question of competition with coal gas is out of the question.

The cost of this apparatus for 30 lights is £40. I think that if consumers would allow the gas engineer the same amount of money to instal high-pressure gas, then the efficiency of coal gas per cubic foot is so increased that the comparisons with coal gas and petrol are still wider than the comparison above. Therefore, a gas engineer would have no difficulty in clearly convincing his consumers as to the saving that can be made by modernizing his coal-gas installation, more especially when the fact is borne in mind that the best results with petrol are obtained with 6-inch pressure. I need hardly state what we can accomplish with coal gas at a similar pressure.

I might mention that the data supplied and quoted upon by petrol makers is in the form of 1000-candle power per hour. This is very misleading; the layman flying to the idea at once of cost per 1000 cubic feet. I would therefore strongly suggest that, where any of our members have to face this competition, they should submit their comparative costs in 1000 candle-power-hours. With such modern forms of burners as the Graetzin and others, and more especially considering the high-pressure results obtainable, the comparative costs then show exceedingly well in favour of coal gas. Some makers even leave out entirely comparisons with coal gas, and confine themselves to acetylene and other forms of lighting for country residences where a coal gas supply is not available.

There are two Litz plants working in Malvern; and the fact that during the night the plants are closed-down (candles having to be substituted as the only means of lighting after that time) speaks volumes for coal gas.

I have endeavoured to bring before your notice a few facts that I have submitted to some of our members who have met with this competition, and venture to think, as coal gas engineers, we have nothing to fear from carburetted air competition where coal gas is anything below 4s. 6d. per 1000 cubic feet.

In a whole-page advertisement that appeared in the "Daily Mail" some time ago, dealing with Malvern, the Litz light had a small proportion of the space wherein it was stated that this system was used for street lighting in the town. This is distinctly an error; coal gas being the only means of street lighting in Malvern. Petrol gas, as far as I am aware—and I am responsible for lighting the streets—has never been used.

ELECTRICITY.

Electricity has received consideration from the presidential chair of this Association on one or two occasions during recent years. I therefore give below a few facts from the competitive point of view with coal gas and electricity with metallized lamps. It is now possible to obtain a 16-candle power lamp for 100 to 130 volts; the earlier type being of 32-candle power. I have tested a few lamps of various makers as below:—

Make.	Rates. Candle Power.	Watts per Hour.	Cost per Hour at 5d. per B.T.U.
A.	50	87·6	0·43
A.	32	52·02	0·26
B.	30	44·6	0 22
C.	50	41·3	0·20
C.	32	28·3	0·14
C.	16	20·4	0·10
D.	32	40·8	0·20
D.	16	21·42	0·10
Carbon.	32	67·2	0·33

I have taken 5d. per B.T.U.; this being our average price in Malvern.

From the above, it will be noted that between the last lamp (which was an improved carbon type—Pope's "Ritelite") and the sixth on the list (which is an Osram), there is a difference in cost of consumption of 42·8 per cent. It can therefore be held that the introduction of this type of lamp is a very great factor to the electrical industry in competition.

The cost of the 16-candle power metallic filament lamp at present is 2s. 6d.; but there is no doubt that the price will be reduced to the present cost of the carbon lamp before very long. The life of these lamps is given on an average of 1000 hours burning. The writer has made several life-tests on this type of lamp, and can state that the results have been very favourable in comparison with the guarantee. In comparing with this lamp the rated candle power of (say) a 4 cubic feet Graetzin type gas-burner, even on ordinary pressures, the difference in cost is very marked, and certainly leaves a very wide margin in favour of coal gas. The fact of being able to turn out a lamp when not in use has been greatly met by the introduction of the pneumatic and other forms of light extinguishers.

Electricity has made a certain amount of progress in Malvern; but, up to the present, the sale of gas has not shown any signs of decrease.

Suction Gas.

It was suggested to me to extend the matter to include suction gas. I am afraid, however, that the small competition that I have met with in Malvern would hardly be of benefit to you; and I feel that there are other members who have had to meet this on a larger scale, and whose facts no doubt would be of greater value. My Committee at the present time have under consideration reduced terms for power.

In conclusion, I may say I have tried to give you a few facts from my own experience in Malvern during the last five years; the data, &c., being taken from actual tests, &c., and therefore perfectly free and unbiassed. I am indebted to Mr. Henry Fowler, M.Inst.M.E., for permission to quote from his paper read before the Institution of Mechanical Engineers in London on Dec. 14, 1906, and Jan. 18, 1907, on "Lighting Railway Premises, Indoor and Outdoor," and his remarks upon the calorific value of carburetted air.

Discussion.

Mr. T. Berridge (Leamington) said Mr. Baker was to be congratulated on bringing forward the matter. They had suffered from this form of competition in Leamington. He was astonished one afternoon to be told that it was intended to introduce the Litz system of lighting at Leamington; and he wrote Mr. Baker on the subject. He was pleased to say that, with the information he got together, he was able to satisfy the Committee that they would be making a mistake by taking up the Litz system, with the result that the order was cancelled; a certain sum being paid as compensation. There was no doubt gas people had a good deal of competition to meet; but he would not mind that so much, were it not that their competitors told such lies—an illustration of which he gave with reference to an electrical lamp that he named. At the end of a twelve months' test with six inverted gas-lamps and a separate meter, the cost worked out at 6s. 4d., compared with £1 13s. 4d. for the electric lamp.

Mr. J. W. Helps (Croydon), on the call of the President, next addressed the meeting, and asked permission to say something first about the parent Institution, of which he had the honour to be President. The parent Institution, he said, had a great deal to look forward to; but its stability and its usefulness depended in a great measure upon the support obtained from the affiliated Associations. He might mention that one great thing they were anxious to do was to organize the industry in such a way as to have a representative body which could take up such questions as they had been discussing that day, and not have them left to be dealt with by outside organizations on their behalf. He confessed that he was not at all satisfied with the present organization of the industry; and he hoped during his term of office to be able to make a suggestion which, if taken up, would increase the usefulness of the Institution. They wanted some better means of combating the competition which came before them. As Mr. Berridge had pointed out, their opponents were not fair in their comparisons; but, if given the opportunity, it could easily be proved that gas lighting was much cheaper than electricity. At the same time, it must be recognized that the electric light had certain advantages which they could not claim for gas; and in this connection he could not help recalling the dream of the President of the North of England Association (Mr. T. H. Duxbury), that there should be gas in every house and the consumer able to light his gas by simply turning a tap and without the use of a match. Scientific attention was being directed to this and kindred matters; and it probably would not be long before they got over the difficulty. They must admit that the user of electricity, being able to turn out the light every time he left the room, did not take as much of the current as he would do if it was like gas. If the gas consumer could turn on and off his gas as the electric light consumer did his current, a great saving would be effected. His (Mr. Helps's) point was that, with improvements, light for light, gas was a long way in advance. As to suction gas, dealt with by Mr. Baker, this was a very important matter to them. In his address before the British Association, Mr. Dugald Clerk referred to suction gas as applied to gas-engines; and when taken to task on the subject, he wrote him (Mr. Helps) asking if he would be prepared to deliver an address on it at the next meeting of the British Association, comparing coal gas with suction gas for gas-engines. He was afraid that he was too busy himself to take up the suggestion; and if he could, he was not sure of getting together the necessary information. Considerable time would be required to bring the proper figures together. They, as an Institution, ought to have some means, and a central body, to carry out these experiments. But he was afraid it would be a long time before they could do this. Still, it was desirable that they should consider the matter, so that they could combat the competition they had, and be able to bring out the truth. With regard to the convenience of the electric light, there were many people who had it installed because they were able to use what he might call "nick-nacks," which they could not have with gas. In mentioning this, he suggested that those present, if they found it convenient, should pay a visit to Mr. Freeman's exhibit at Olympia, and note the beautiful effects which could be obtained from gas.*

Mr. Harold E. Copp (West Bromwich) said it was quite time the gas industry had some organization of the kind mentioned by the President of the Institution of Gas Engineers. A friend of his showed him an extract from an electrical paper of the previous week. There was hardly a statement contained in the whole article which was correct as applied to the gas industry, and he was asked to write a reply; but he had not time. He thought there should be some central organization that could take these matters up. Somehow or other their opponents seemed to get hold of what he described as the "secular press." They could hardly take up any of these papers without finding something about other illuminants and improvements; but they very seldom came across anything about the recent improvements made in gas lighting. Several engineers had told him they had contributed certain information to these secular papers, but had been unable to get their communications published. He quite agreed that before they could have an organization to deal with these matters, they must have more liberal contributions from those concerned. Turning to deal with the paper read by Mr. Baker, he said that recently he had come into competition with a form of incandescent lighting by means of oil, and somewhat to his disadvantage; and this was an aspect of the question they would have to face. Mr. Copp mentioned that in these tests he had used the Graetzin lamp, and had been beaten on the question of cost and illumination. As to suction gas, he had been able to demonstrate that the balance was in favour of town gas; and it was satisfactory to know that a number of people who had employed suction gas had resumed the use of town gas.

Mr. S. G. Perrett (Market Drayton) said that in his town they had had to compete with electricity for the past seven years. When the installation was put down, he was told that gas would be snuffed out before long. Well, the gas-works were still going; and, in spite of the competition, they were 75 per cent. ahead of their sales than when the Electric Light Company came to the town. What was more, he had the satisfaction of knowing that the Electric Light Company had paid no dividend yet.

Mr. Thomas Glover (Norwich) remarked that one serious feature of the competition they had to face was that people having once taken up the electric light were not likely to go back to gas. He thought that much could be done through showing people, by means of exhibitions, the beautiful effects that might be obtained from gas.

On the motion of Alderman W. R. Cooper (Banbury), seconded by Mr. Berridge, a hearty vote of thanks was accorded to the readers of the papers.

Mr. Helps and Mr. Baker briefly acknowledged the compliment paid them.

* This exhibit is referred to in another part of to-day's issue.—Ed. J.G.L.

EFFECT OF SEA WATER ON CONCRETE.

In order to test the effect of sea water on concrete within the range between high and low tide levels, Professor M. Möller, of Brunswick, built on the North Sea a small structure, partly composed of reinforced concrete moulded in place and partly of slabs moulded elsewhere and placed in the structure forty days after they were made. The structure was a small mound of trapezium shape, with the sloping sides made with plates 7 c. (2·8 inches) thick, and the top and floor with a 5 c. (2-inch) slab moulded in place. The interior was filled with mud and a clayey and easily moved sand. The construction and the effects of the sea water were described by Professor Möller in a paper presented to the Copenhagen Congress of the International Association for Testing Materials, from which the following particulars (reproduced from "Engineering Record") are taken.

The side plates were made with 1 to 2½ to 2 concrete, with crushed gravel as the coarse aggregate, and the bottom and top slabs with 1 to 3 to 3 gravel concrete. The top was covered to a depth of 3·28 feet by the rising tide the day after it was laid. The concrete produced *in situ* hardened only for a time, and afterwards became soft when damp and friable when dry; and whitish efflorescences were formed on its surface. The action of the

waves accordingly made holes in the covering-plates of the little structure in less than four years after its erection. At first, the holes were patched up again; but this process was afterwards given up. In order, however, to reduce the washing-out of the fine-grained muddy sand filling, a layer of coarse sand was put on the top of the cover.

While the freshly-made concrete did not prove satisfactory in the structure, and the upper iron reinforcement, which on its destruction was laid bare, very soon rusted through and disappeared, the plates themselves, the concrete forming which was forty days old before coming in contact with the sea water, and had therefore already become hardened, behaved exceedingly well; and the iron reinforcement of the latter behaved equally well, so far as its condition could be ascertained. The surface of the concrete plates had only become somewhat rough. The little structure was surveyed last month, and then taken down after being subjected to the action of sea water and air alternately for thirteen years.

Professor Möller reported three other cases in which concrete or cement mortar that was brought in contact with sea water too soon after mixing became soft and showed a whitish efflorescence. One of these was the foundation for a lighthouse which had been lowered in the form of a well, another a slab for bank protection, and the last slabs made on ground that was soaked with sea water during a previous flood.

ADVANCES IN INVERTED GAS LIGHTING.

A paper which was read by Herr M. Scholz, of the firm of Ehrich and Graetz, of Berlin, at this year's meeting of the Association of Gas and Water Engineers of Austria-Hungary, at Gratz, has been published in the "Zeitschrift" of the Association. A few particulars of general interest may be quoted from the paper.

The author first called attention to the recent production of a small size Graetzin lamp suitable for replacing electric glow-lamps in places where a powerful light is not required. This lamp has a consumption of 1·06 cubic feet per hour, and gives a light of 30 hefners (or 27 English candles). This burner should efficiently take the place of metallic filament electric lamps of 35 watts consumption which give a light of 29 candles. A tabular statement shows that, at the relative prices of gas and electricity in eleven important cities on the Continent, the cost of gas for this burner will vary from one-sixth to one-fourth the cost of current for the electric metallic filament lamp of approximately the same candle power. In connection with these and the larger sizes of Graetzin lamps, a pressure-regulating nozzle has been introduced, which comes into action at a pressure of 14-10ths and allows the outlet pressure to rise by only about one-tenth, even though the inlet pressure reaches 40-10ths. The object of this governing device is, of course, to prevent the formation of soot, when an increased quantity of gas is consumed by the burner through the pressure in the service-pipe rising above the normal. Even when soot is not formed, the duty of the burner falls off if the rate of consumption exceeds that for which the burner was designed. For the lighting of school-rooms and drawing-offices where indirect lighting is often preferred, the inverted burner is now provided with a hemispherical glass, of which the lower part is matt or frosted. The upper part is clear, and the light issuing therefrom is reflected downwards by a reflecting screen placed round the lamp above the level of the burners. Thus light passes directly through the diffusing surface of the lower half of the hemispherical glass, and is then indirectly reflected downwards by the reflecting screen. The effect is practically that of wholly indirect lighting.

Great advances have been made in high-pressure inverted lighting; and the three-burner Graetzin street-lamp of 3600-candle power gives directly below the lamp an illumination of 190 Lux. Curves of the light distribution from these lamps and from flame arc lamps show that the illumination on the surface of a thoroughfare is far more uniform by gas-lamps than by arc-lamps. Curves and figures obtained by Professor Drehschmidt which have been already given in the "JOURNAL" [Vol. CIII., p. 583] are reproduced by the author. Great importance is attached to the application to these high-pressure street gas-lamps of an efficient automatic pressure igniting device, and an improved form of such a device has recently been fitted to a large number of the high-pressure gas-lamps in Berlin. The durability of the mantles is now considerably greater than in the early years of high-pressure lighting. The average life of the mantles for the two-flame lamps of about 1800-candle power, and for the three-flame lamps of about 3600-candle power is about 200 burning hours. The less powerful high-pressure gas-lamps which have considerably smaller mantles show a much longer life for the latter. It has been shown that the cost of compression according to the experiences gained in Berlin amounts to 2·4d. per 1000 cubic feet, including interest and amortization for the engines and the apparatus, the running charges of the engines, gas consumption of the motors, wages, lubricants, and repairs.

In regard to the relative economy of gas and electric lighting, the author has compiled a tabular statement for eleven towns on the Continent, taking the actual prices of gas and electricity in each of them. He compares five types of inverted gas-burners with five types of electric lamps of approximately the same illuminating power. For instance, the gas-burner of 1·06 cubic feet per hour consumption, affording a light of 27 English candles, is paired with a metallic filament electric lamp consuming 35 watts per hour, and giving a light of 29 candles. A gas-burner of 1·77 cubic feet per hour consumption, giving a light of 45 candles, is paired with a metallic filament glow-lamp of 55 watts per hour consumption, likewise giving a light of 45 candles. The third pair comprises a gas-burner of 3·17 cubic feet consumption, giving a light of 99 candles, and a metallic filament lamp of 110 watts consumption, giving a light of 90 candles. The fourth pair is a lamp with two low-pressure Graetzin burners, consuming 7·4 cubic feet per hour and yielding about 234 candles, and an arc lamp, consuming 160 watts per hour and yielding about 189 candles. The final pair comprises a lamp with three high-pressure gas-burners, consuming 70·6 cubic feet per hour and giving an illuminating power of 3600 candles, and a flame arc lamp with Alba carbons, consuming 825 watts per hour and giving a light of about 2790 candles.

Comparative Working Costs per Hour of Gas and Electric Lighting in Various Towns.

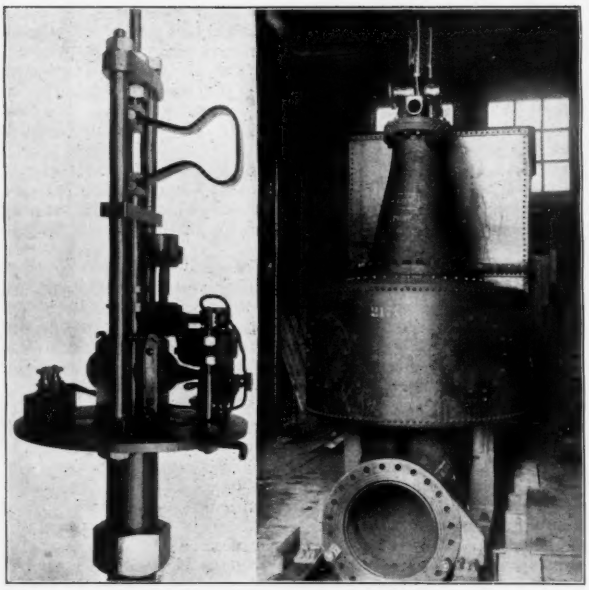
Town.	Price of Gas per 1000 Cubic Feet.	Price of Electricity per Unit.	Lamps with Two Low-Pressure Graetzin Burners, Consuming 7·4 Cubic Feet per Hour and Yielding 234 Candles.	Arc Lamps Consuming 160 Watts per Hour and Yielding 189 Candles.	Lamps with Three High-Pressure Graetzin Burners, Consuming 70·6 Cubic Feet per Hour and Yielding 3600 Candles.	Flame Arc Lamps with Alba-Carbons Consuming 825 Watts per Hour and Yielding 2790 Candles.	Greater Cost of Electric as Compared with Gas Lighting.
	s. d.	Pence.	Pence.	Pence.	Pence.	Pence.	Per Cent.
Berlin	3 6	4·8	0·31	0·77	2·96	3·96	61·5
Vienna	4 0	5·3	0·36	0·85	3·40	4·37	55·4
Bremen	3 10	8·4	0·34	1·34	3·24	6·93	158·4
Cassel	4 6½	8·4	0·4	1·34	3·84	6·93	118·3
Cologne and Dresden	4 6½	6·0	0·4	0·96	3·84	4·95	55·9
Frankfort-on-Maine	4 5½	6·0	0·4	0·96	3·77	4·95	58·6
Königsberg	4 6½	6·6	0·4	1·06	3·84	5·45	71·6
Leipzig and Magdeburg	5 1	7·2	0·45	1·15	4·14	5·94	66·1
Stettin	4 6½	7·2	0·4	1·15	3·84	5·94	87·1

The author sums up the cost of gas per hour for the five types of gas-lamps in each town, and also the cost of current for the electric lamps, and states by how much per cent. the cost of the electric-lamps exceeds that of the gas-lamps. These figures are given in the last column of the above table, which shows also the prices of gas and electricity prevailing at the present time in the Continental towns selected by the author and the figures for the last two pairs of gas and electric lamps, which are those applicable more particularly to street lighting, whereas the three earlier pairs are all lamps suitable for indoor lighting. It appears that, on the average, the cost of electric lighting in the eleven towns referred to is 80 per cent. higher than that of Graetzin inverted gas lighting, notwithstanding that the candle power of the flame arc lamps is considerably lower than that of the three-burner high-pressure gas-lamps with which they are paired for purposes of comparison.

Researches on Heat Transmission.—At the meeting of the Institution of Mechanical Engineers on the 15th inst., a paper was read by Professor W. E. Dalby, setting forth the results of researches he had undertaken on the subject of "Heat Transmission." The author explained, at the outset of the paper, that his object was to place before the members a general view of the work done relating to the transmission of heat across boiler heating surfaces. In order to do this, it had been necessary to search for papers bearing upon the subject which had been contributed to the Technical Press and to the various Societies in Europe and America. Upwards of 500 papers had been read, and lists of those relevant to the subject were given in an appendix. Abstracts of the more important papers had been made in a way which would enable anyone specially interested in a particular problem of heat transmission to ascertain whether the original paper contained information likely to be useful in connection therewith. These abstracts (in MS.) were in the library of the Institution, where they could be readily referred to.

HUMPHREY'S INTERNAL-COMBUSTION PUMP.

In the last number of the "JOURNAL," brief reference was made to the new internal-combustion pump designed by Mr. H. A. Humphrey, in which gas explosions are utilized for raising water. The pump was incidentally referred to by Mr. Humphrey in the discussion on a paper by Messrs. Hawksley and Davey, on "The Cost of Pumping by Various Methods," submitted at the Engineering Conference in 1907, and noticed in our columns at the time.* It was also alluded to, as mentioned last week, in the discussion on the paper, on "The Use of Large Gas-Engines for Generating Electric Power," brought before the Institution of Electrical Engineers early in the year by Messrs. Leonard Andrews and Reginald Porter. The pump, which is the outcome of experiments carried on over a period of two years, is of interest to all engineers; and therefore we give some particulars as to its construction and working—the latter being taken from a report on an official test recently carried out by Professor W. Cawthorne Unwin, F.R.S., at Dudley Port.



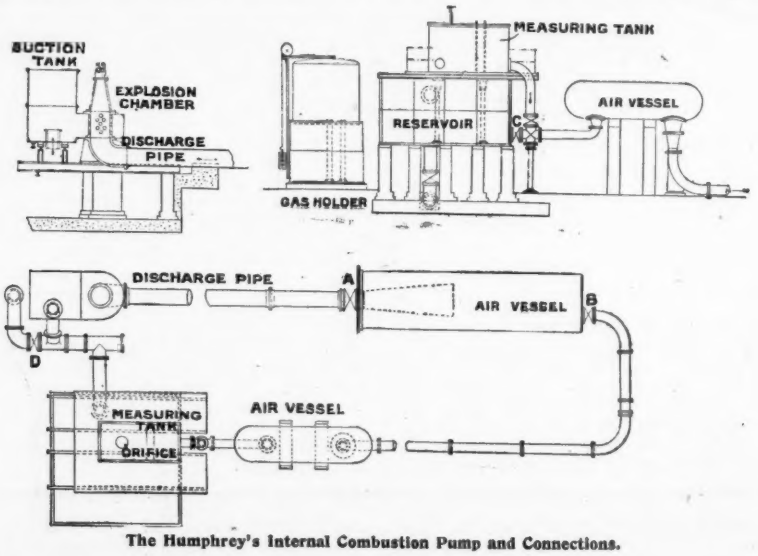
Ignition Gear. General View of Pump.

[The ignition apparatus is a combined instrument for firing the charge at the maximum compression pressure incidental to each particular charge or for firing at a fixed pressure.]

The first diagram of the accompanying illustrations shows the arrangement of the pump, which, as will be seen, is exceedingly simple. The cone-shaped explosion chamber has below it the water valve-box, which is connected by a bend to the discharge-pipe, whereby the water is conveyed to an elevated tank. In the top of the explosion chamber (on the left and right) are fitted the admission and exhaust valves; and, with the exception of simple interlocking gear between these valves, and a small ignition apparatus, there are no other parts to the pump. The supply-tank, to the left of the explosion chamber, has an extension embracing the valve-box, and so feeds water through non-return valves which open inwards. By means of these simple elements, a cycle is maintained giving four unequal strokes, such as theory requires for a perfect thermo-dynamic cycle, with expansion carried to atmospheric pressure. A description of the various steps in the cycle will show how this end is achieved.

Starting from the point at which the compressed combustible charge is ignited at the top of the explosion chamber, the explosion sets in motion the column of water contained between the chamber and the elevated tank, and drives it towards the latter. As the burnt products expand, the velocity of the column of water increases until the pressure of the gases becomes equal to the static head of the raised water. But at this point the column is moving at (say) 10 feet per second, and its momentum is considerable; the discharge-pipe being some 50 feet long. Consequently the flow towards the tank continues, with the result that atmospheric pressure is reached in the explosion chamber, the exhaust-valve falls open by its own weight, and the water-valves open, due to the head of water in the supply-tank. Water immediately flows through the valves, some following the moving column in the discharge-pipe and some rising in the explosion chamber to displace the burnt products which pass away through the exhaust valve. The water which rises in the chamber tends to reach the level of the water in the supply-tank, so that by the time the column in the discharge-pipe comes to rest, and tends to return under the head of the elevated tank, the explosion chamber is already nearly full of water. The return flow in the discharge-pipe drives out more products, and closes the water-valve; and when the level in the explosion chamber reaches the exhaust-valve, the water shuts it by impact—closing all egress, and imprisoning the remaining products in the space shown above the chamber.

Up to this point there was no resistance to the backward flow; and so the column has gained velocity. But further movement involves the compression of the remaining products, which constitute an elastic cushion, and serve to bring the column to rest again. As both the static head and the kinetic energy of the moving column have played a part in compressing the elastic cushion, it follows that the pressure reached exceeds the static head, and therefore the elastic cushion will expand and produce a second outward flow. The shutting of the exhaust-valve locked it, and unlocked the inlet-valve; and as the water level falls in the explosion chamber, atmospheric pressure is again reached at the level of the exhaust-valve. Beyond this, the movement of the water would produce a vacuum; but the suction opens the inlet-valve, and draws in a new combustible charge. It is obvious that, but for frictional loss, the water level in the explosion chamber would, before coming to rest, fall back to the level from which the last upward movement started. But the actual quantity of charge drawn in is a little less than this amount of movement would indicate. The final stage of the cycle, which has now been reached, consists in a second return flow to compress the new charge. The degree of compression will greatly exceed that due to the static head, as the kinetic energy of the moving column is



The Humphrey's Internal Combustion Pump and Connections.

utilized in the work of compression. Everything is now ready for a fresh explosion.

We have next to deal with Professor Unwin's report on the pump as fitted up at Dudley Port, where it is worked by Mond producer gas. He states that it works absolutely automatically, without attention, when once adjusted, and starts with a charge of compressed air with the greatest ease and certainty. Starting all cold, an explosion occurred in five seconds, and the pump continued acting regularly. It worked throughout the trials with varying lift, without any change in the gas and air mixture, or

* See "JOURNAL," Vol. XCIX., p. 635.

any alteration in the cushion volume, and also without a single misfire or hitch of any description. He adds: "The results are very remarkable. The fuel consumption in these trials, reckoned on the work done in lifting water, was less than in any pumping arrangement, either by gas or steam, hitherto recorded."

The arrangements for the trial are shown in the accompanying diagram. The gas was supplied from a holder, which during a trial was shut off from the gas-main. The quantity of gas used was determined from the fall of the holder during 10 or 12 minutes; the pressure and temperature being noted, and the gas assumed to be saturated with moisture. The explosion chamber with its suction-valves communicated with a discharge-pipe 135 feet in length and 2 feet diameter. This discharged into a very large air-vessel. At the outlet from this was a sluice-valve B, at which a man was stationed, opposite a pressure-gauge. By slight adjustments of the sluice, he secured the maintenance of a nearly constant pressure in the large air vessel. The lift was measured by a mercurial syphon gauge, one leg of which was connected to the suction-tank, and the other to the water in the large air-vessel. The difference of level of the mercury columns is a direct measure of the height of lift of the pump. The valve A was full open during the trials.

From the large air-vessel the water passed through a second smaller air-vessel to a measuring-tank with stilling screens. In the bottom was a 9-inch sharp-edged orifice, through which the water fell back into the water reservoir supplying the suction-tank. The head over the orifice, taken at about 1½ minute intervals during a trial, afforded a means of determining the pump discharge. Valves C D were closed throughout the trials.

The pump ran continuously during the morning and the afternoon; the lift being maintained constant the whole period of each series of tests. These were necessarily intermittent, as the gas-holder required refilling at short intervals; the pump being connected directly to the gas-main while refilling the holder. In the morning, with the greater lift, the duration of each test of the series was 10 minutes; but in the afternoon, with smaller lifts, it was 12 minutes.

Professor Unwin gives particulars in regard to the quantity of water lifted, the pump-horse-power, the consumption and analyses of the gas, the expenditure of heat, and the pressures in the explosion cylinder, and then sets forth the general conclusions at which he arrived as the result of his investigations. In the course of these, he states that the fuel economy effected by the pump is, so far as he knows, unequalled. The following is a summary of the gas and heat expenditure:—

Lift.	Pump-Horse-Power.	Mond Gas Used per P.H.P. Hour, at 760 mm. and 0° C.	Calorific Value of Gas per Cubic Foot. B.Th.U.	Heat Expended per P.H.P. Hour. B.Th.U.	Pounds of Anthracite in Producer per P.H.P. Hour.
Feet.		Cubic Feet.			
32·87	16·15	83·12	147·3	12,243	1·063
25·95	12·32	90·93	143·5	13,037	1·132
20·73	10·99	93·61	145·3	13,596	1·180

Professor Unwin says: "An ordinary gas-engine of three times this power, and using similar gas, would use at full load 72 to 84 cubic feet of gas per brake-horse-power, and 95 to 100 cubic feet at half full power. If set to drive any form of pump, the gas consumption, reckoned on the pump-horse-power, would be considerably greater. The Humphrey pump, lifting water, works with about the same economy as a gas-engine driving itself only."

The Humphrey pump is then compared with a gas-engine and a steam-pump. We gave last week Professor Unwin's remarks on the former; but, for the sake of completeness, reproduce them: "Suppose a gas-engine driving a centrifugal pump required to do 16 P.H.P., on a lift of 33 feet, or the same work as the Humphrey gas-pump tested. On such a lift, the efficiency of the centrifugal pump would certainly not exceed two-thirds, and might be rather less. Hence the gas-engine would have to supply in normal working 24 B.H.P. at the pump-shaft. Gas-engines will not work with an overload; and to be safe, it would be desirable and usual to have a gas-engine of 32 H.P. (maximum), which in normal work, supposing the efficiency of the pump to be as assumed, would develop three-quarters of maximum power. So working, it would require 80 to 85 cubic feet per hour of gas of the quality used in the preceding trials for each brake-horse-power. Hence, it would require 80 × 24 to 85 × 24, or 1920 to 2040 cubic feet per hour. The comparison, therefore, stands thus: Gas-engine and centrifugal pump 120 to 127 cubic feet of gas per P.H.P. hour; Humphrey gas-pump, 83·1 cubic feet of gas per P.H.P. hour. Working with less load, the comparison would probably be more favourable to the Humphrey pump, because as the lift decreased, the efficiency of both the gas-engine and the centrifugal pump would diminish."

In comparing the Humphrey pump with a steam-pump, Professor Unwin remarks that small steam-pumps are notoriously inefficient and wasteful of fuel, and consequently a comparison with them would be useless. But to show how remarkable the fuel economy of the Humphrey pump is, he says it may be compared with large steam pumping-engines of the highest class. Some years ago he made careful and complete tests of a pair of compound and a pair of triple-expansion engines at the West Middlesex Water-Works. They were high-duty Worthington engines, of exceptionally low steam consumption, with boilers which gave a high evaporative efficiency with picked Welsh coal. The following table shows that these fine steam-engines, with the advantage of much greater lift, did not approach in economy the Humphrey gas-pump; the compound engine requiring twice as much coal per pump-horse-power as the Humphrey pump.

—	High-Duty Worthington Engines.			Humphrey Gas-Pump, Sept., 1909.
	Compound. Nov., 1888.	Triple. Dec., 1896.	Triple. Feb., 1897.	
I.H.P.	255·5	370·5	498·4	..
P.H.P.	217·1	320·3	449·8	16·15
Lift in feet.	53·7	92·3	129·1	32·90
Quantity pumped in gallons per minute	13,407	11,450	11,497	1621
Coal per I.H.P. hour	1·696	1·402	1·530	..
Coal per P.H.P. hour	1·996	1·622	1·695	1·06

In the case of the compound steam-engine, the expenditure of heat in the boilers was 494 B.Th.U. per minute per pump-horse-power. The corresponding expenditure in a producer for the Humphrey gas-pump would be 250 B.Th.U.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Opening Meeting of the Sixth Session of the Scottish Junior Gas Association—Western District—was held in the Glasgow and West of Scotland Technical College, Glasgow, on Saturday evening. There was a larger attendance than had been for many months at the meetings of this division of the Association.

Mr. A. H. WHITELAW (Glasgow) took the chair, and, in opening the proceedings, said that as his term of office had expired, he would take this last opportunity of thanking the members for the honour they did him in electing him President last session. He thanked the honorary members and the Council for their hearty co-operation with him in the discharge of his duties. There could be no doubt, he said, that, as an Association, they had justified their existence. He would now call upon his successor—Mr. D. Currie, of Stirling—to take the chair, and ask him to deliver his Presidential Address.

Mr. CURRIE then took the chair, and said, before proceeding with his address, he should like the members to accord to Mr. Whitelaw a very hearty vote of thanks for the able and effective manner in which he had conducted the affairs of the Association during the past year. He had taken more than an ordinary interest in it since its inauguration, and he (Mr. Currie) thought it was worthy of their attention that during the past session Mr. Whitelaw had not been absent from a single meeting or visit. He hoped that, though Mr. Whitelaw was retiring from the chair, he would continue to manifest the same interest in the Association that he had done in the past.

The vote having been accorded, Mr. WHITELAW returned thanks.

PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his Inaugural Address, in the course of which he said: The subject of my address is

NOTES ON THE VALUATION AND SELECTION OF GAS COALS.

In deciding upon this subject, it occurred to me that it might prove interesting to the members of the Association, and at the same time lend sufficient scope for a profitable discussion. The valuation and selection of gas coals is a subject or duty which confronts every gas manager when purchasing a supply of gas coal; and the financial success of every gas undertaking depends to a great extent upon the judicious selection of the coal. When a gas company or a corporation receives tenders for a supply of coal, it will be observed that colliery owners and coal merchants generally supply copies of the analyses of the coals they are offering for sale; and the purchasers largely depend upon these analyses to aid them in the selection of the coal they are requiring. In going through a batch of coal analyses, it will be found that they are signed by various analysts; and in some cases the coal merchants tabulate on one sheet part of the analyses of the various coals they are offering for sale. These tabulated part analyses are generally not signed by any analyst, and are therefore worthless for making comparisons with other signed analyses which give a complete account of the tests.

In making a selection of coal under the conditions mentioned, many difficulties present themselves. In the first place, there is the difficulty of comparing the analyses of different coals tested by different analysts, as it is a well-known fact that it is practically impossible to get any two analysts or chemists to test coal precisely alike; and the question of different test plants has also to be taken into consideration. In order, therefore, to be able to make reliable comparisons of the relative value of different coals, it is necessary that the various coals should be tested by the purchaser; and it is my humble opinion that all gas-works of any appreciable size should have coal-test plants of their own. The advantages of having such plant are many. Firstly, there is the advantage of being able to test the coals at the time of purchase, instead of depending on coal merchants' analyses, which are in

TABLE A.—*Tabulated Statement of the Products of Three Coal Tests.*

Number of Coal.	Gas per Ton of Coal.	Illuminating Power.	H_2S in Gas.	CO_2 in Gas.	Tar per Ton of Coal.	Ammoniacal Liquor per Ton of Coal.	NH_3 in Liquor.	NH_3 in Liquor per Ton of Coal.	NH_3 in Unscrubbed Gas per 100 Cubic Feet.	NH_3 in Unscrubbed Gas per Ton of Coal.	Total NH_3 per Ton of Coal.	Coke per Ton of Coal.	Ash in Coke.	Ash in Coke per Ton of Coal.
	Cub. Ft.	Candles.	Per Cent.	Per Cent.	Lbs.	Lbs.	Per Cent.	Lbs.	Grains.	Lbs.	Lbs.	Lbs.	Per Cent.	Lbs.
1	11,632	21·04	0·75	2·20	147·86	154·60	1·06	1·63	386	6·41	8·04	1436·96	4·80	68·97
2	11,525	18·51	0·40	1·25	122·60	53·84	1·36	0·73	411	6·76	7·49	1618·40	2·20	35·60
3	12,145	20·04	1·50	2·00	152·50	227·81	1·06	2·41	321	5·56	7·97	1357·21	4·40	59·71

some cases over twenty years old. There is also the advantage of being able to test the selected coal from time to time during delivery, to see that the quality is being maintained.

Great diversity of opinion exists as to the reliability of the tests obtained with coal-test plants. In Stirling there is a small test plant capable of dealing with 2·24 lbs. of coal per test, or 100oth part of a ton; and the test results obtained with this small plant, compared with the practical results, have proved most satisfactory. Last year in Stirling over 12,000 tons of coal were carbonized; and the average yield of gas per ton for the whole year was equal to about 95 per cent. of the results obtained in the laboratory with the test plant. This consists of a small muffled retort, heated by means of a series of bunsen burners. The gas leaving the retort is conveyed direct to the condenser, which is a water-cooled one, and provided with pockets for collecting the tar and ammoniacal liquor. After passing through the condenser, the gas travels through two small purifiers in rotation, and is then collected in a graduated counterbalanced gasholder, capable of holding 11 cubic feet of gas. There is also a spare holder which permits of a test going on while the volumetric analysis for impurities, &c., of the previous test is being conducted.

The following is a brief account of the method adopted in Stirling for testing gas coals: A sample is taken from a coal-waggon, a shovelful being laid aside from time to time as the waggon is being emptied. The heap laid aside should be a fair sample of the contents of the waggon, as it consists of large and small coal and also coal dust. The large coal is broken down to a uniform size, and the heap is then turned over a few times in order to thoroughly mix the contents. It is then divided into two portions —one being retained for conducting the test. This portion is again thoroughly mixed, and then divided into two portions. The process is continued until the quantity retained is capable of serving for (say) six tests. I may mention at this point that the accuracy of the results obtained with a test plant depends greatly upon the manner in which the sample of coal is taken. The operation of mixing the coal should be performed on a clean concrete floor. Four tests of each coal are generally made; but the first is not taken note of, as it is merely put through the plant to clear out the gas of the previous test.

When the charge is completely burned off, the inlet of the gasholder is closed, and the retort mouthpiece lid is opened. The quantity of gas in the holder is then taken note of, and also the temperature and barometrical pressure of the gas. The coke is then collected in a clean tray, and allowed to cool in the atmosphere, no water being used to quench or cool it. When the coke is perfectly cool, it is accurately weighed, and a record kept of the weight. The tar and ammoniacal liquor are then collected from the condenser, and the weight of both is carefully noted. The percentage of ammonia in the liquor is ascertained afterwards by means of the distillation test. The gas is then tested for illuminating power, durability, and impurities. The other chemical tests are performed afterwards, and the necessary calculations made. When three complete tests are made, the average of the three is recorded as the analysis of that particular coal.

I may state that, in testing various coals for comparison, great care should be taken to test each coal in precisely the same manner, as otherwise the results would be misleading. Assuming that three different coals have been tested, and it is desired to ascertain the relative value of each, the following method is adopted: The products of the tests, which have a bearing on the valuation of each coal, are tabulated in the order shown in Table A.

When the products of the various coals have been entered up as shown in the table, the products of each coal are valued separately, as per Tables B, C, and D. The price attached to each product must be strictly adhered to when valuing the products of any number of coals, as the whole principle and success of the method of valuation depends upon valuing each product of each coal at precisely the same rate. In referring to Tables B, C, and D, you will observe the form in which the various products are valued.

The gas product, it will be observed, is valued at so much per 1000 cubic feet, instead of on the sperm value basis, as is frequently done. With the almost universal adoption of the incandescent burner for lighting purposes, I consider the gas basis is the proper method to adopt in valuing the gas product. Before the advent of the incandescent burner, when the illumination was entirely dependent on the illuminating power of the gas, the sperm value basis was undoubtedly the proper method to adopt. The deduction for purification, you will observe, is merely for sulphuretted hydrogen, as we only remove this in Stirling. Should lime be employed for the purification of the gas, the percentages of sulphuretted hydrogen and carbonic acid would be

TABLE B.—*Valuation of Products of Coal No. 1.*

	£ s. d.	£ s. d.
Gas—		
11,632 cubic feet, at 2s. 6d. per 1000	1 9 0·96	
Deduct purification—		
0·75 p. ct. H_2S, at 0·2d. p. ct. per 1000 c. ft. ∴ 0·75 × 0·2 × 11·632 = 1·74d.	0 0 1·74	
Value of gas product . .		1 8 11·22
Tar—147·86 lbs., at 16s. per ton . .		0 1 0·67
Ammonia—8·04 lbs., at 3d. per lb. . .		0 2 0·12
Coke—1436·96 lbs., at 10s. per ton . .	0 6 4·98	
Deduct ash in coke—		
68·97 lbs., at 10s. per ton . . .	0 0 3·69	
Value of coke product. .		0 6 1·29
Total value of coal products .		£1 18 1·30

TABLE C.—*Valuation of Products of Coal No. 2.*

	£ s. d.	£ s. d.
Gas—		
11,525 cubic feet at 2s. 6d. per 1000	1 8 9·75	
Deduct purification—		
0·40 p. ct. H_2S, at 0·2d. p. ct. per 1000 c. ft. ∴ 0·40 × 0·2 × 11·525 = 0·92d.	0 0 0·92	
	1 8 8·83	
Deduct cost of enrichment—		
2½ candles, at ½d. per candle per 1000 c. ft. ∴ 2·5 × 0·5 × 11·525 = 1s. 2·40d.	0 1 2·40	
Value of gas product . .		1 7 6·43
Tar—122·6 lbs., at 16s. per ton . . .		0 0 10·50
Ammonia—7·49 lbs., at 3d. per lb. . .		0 1 10·47
Coke—1618·4 lbs., at 10s. per ton . .	0 7 2·70	
Deduct ash in coke—		
35·6 lbs., at 10s. per ton . . .	0 0 1·90	
Value of coke product . .		0 7 0·80
Total value of coal products .		£1 17 4·20

TABLE D.—*Valuation of Products of Coal No. 3.*

	£ s. d.	£ s. d.
Gas—		
12,145 cubic feet of gas, at 2s. 6d. 1000 c. ft.	1 10 4·35	
Deduct purification—		
1·5 p. ct. H_2S, at 0·2d. p. ct. per 1000 c. ft. ∴ 1·5 × 0·2 × 12·145 = 3·64d.	0 0 3·64	
	1 10 0·71	
Deduct cost of enrichment—		
1 candle, at ½d. per candle per 1000 c. ft. ∴ 1 × ·5 × 12·145 = 6·07d.	0 0 6·07	
Value of gas product . .		1 9 6·64
Tar—152·5 lbs., at 16s. per ton . . .		0 1 1·07
Ammonia—7·97 lbs., at 3d. per lb. . .		0 1 11·91
Coke—1357·21 lbs., at 10s. per ton . .	0 6 0·70	
Deduct ash in coke—		
59·71 lbs., at 10s. per ton . . .	0 0 3·19	
Value of coke product . .		0 5 9·51
Total value of coal products .		£1 18 5·13

added together, and calculated at the rate per 1000 cubic feet which it costs to purify the gas.

In Tables C and D, I show a deduction from the gas product for enrichment. In explanation of this item, I may state that we are obliged to supply gas of 20-candle power in Stirling; and when testing coals it is our custom to take into account the cost of enriching the gas up to 21 candles, when the gas of any particular coal does not yield this illuminating power. When the gas exceeds 21 candles, the coal is credited with the difference between 21 candles and the ascertained candle power, at the same rate as the deduction is made when the candle power is under 21. This illuminating power of 21 candles is adopted as a standard. The tar product, instead of being calculated at the rate per gallon, is calculated at the rate per ton, as the tar is sold by weight, not by measure. The ammonia product, you will observe, is calculated at the rate per pound.

In referring to Table A, you will find the ammoniacal liquor is stated in weight instead of gallons. I am aware it is the usual custom to state the quantity of ammoniacal liquor in gallons of so many degrees Twaddel strength; but I am of opinion that the latter method is not a reliable one for ascertaining the value of

ammoniacal liquor, and therefore I prefer the method of weighing the liquor, and ascertaining by means of the distillation test the percentage of ammonia it contains. The ammonia item includes both the ammonia in the liquor and that which is in the crude or unscrubbed gas.

Having ascertained the total value of the products of each coal, the totals are transferred to a table similar to Table E.

TABLE E.

No. of Coal.	Net Value of Coal Products.	Value in Relation to Standard.	Price of Coal at Works.	Purchase Value of Coal in Relation to Standard.	*Minus* Value in Relation to Standard.	*Plus* Value in Relation to Standard.
	£ s. d.	Per Cent.	£ s. d.	£ s. d.	£ s. d.	d.
1 (standard)	1 18 1·30	100	0 11 0	0 11 0·00	—	—
2	1 17 4·20	98·01	0 10 8	0 10 9·37	—	1·37
3	1 18 5·13	100·83	0 10 6	0 11 1·09	—	7·09

The purchase price of each coal is entered in the column provided for the purpose, and one particular coal is fixed upon as a standard. We will assume coal No. 1 to be the standard in this instance. The value of the products of the standard coal is entered up as being equivalent to 100 per cent. By proportion, the value per cent. of the products of the other coals in comparison with the standard can easily be calculated, thus:

As £1 18 1·30 : 100 per cent. :: £1 17 4·20 : 98·01 per cent.

and

As £1 18 1·30 : 100 per cent. :: £1 18 5·13 : 100·83 per cent.

When the relative value per cent. has been ascertained, the purchase value in relation to the standard may be calculated in a similar manner, thus:

As 100 per cent. : 11s. :: 98·01 per cent. : 10s. 9·37d.

and

As 100 per cent. : 11s. :: 100·83 per cent. : 11s. 1·09d.

The difference between the purchase value and the contract price of each coal is then entered in the *minus* or the *plus* value column as the case may be, and the coal having the largest *plus* value denotes the cheapest coal. Coal No. 3 in Table E works out as being the cheapest coal.

There are various other items which should be taken into account in making out the relative valuation of coals. For instance, when there is a marked difference in the volume of gas produced per ton of coal compared with the standard coal, an allowance should be made for difference in carbonizing costs. These should include both labour and plant (retorts, &c.), and the necessary addition or reduction of value made on the coal under test. In Stirling, we do not make any allowance for difference in carbonizing costs due to any difference in the volume of gas produced per ton of the various coals under test, as the coals in the vicinity of Stirling which we periodically test give off a similar volume of gas per ton, and any little difference there may be between them would not warrant us making any allowance for difference in carbonizing costs, as our labour is at a minimum, and the plant in use would be the same, no matter which of the coals under test was selected. In large or medium-sized works, where hand labour is employed, this item for difference in carbonizing costs should be taken into consideration.

When the relative value of each coal has been ascertained, it has not to be assumed that the coal showing the largest *plus* value would be the best coal to select, judging from a financial point of view, as there are a few other items which have great bearing on the financial aspect of the question. The first item is the question of moisture, which plays a very important part in the success or otherwise of carbonization in practical working. When a coal contains a large percentage of moisture, it will be found that a proportionately large quantity of fuel is consumed in the producers for maintaining the heats of the retorts to the desired temperature; and it will also be found that a much longer time is required to burn off the charges. In a small test plant such as I have described, with the retort heated by gas, these items cannot be ascertained with any degree of accuracy in order to make the necessary allowance in the valuation of the various coals. The selector of the coal has therefore to bring his practical knowledge and experience into operation to aid him in making allowance for difference in moisture. Another item which should be taken into consideration is the percentage of ash in the coke. When this exceeds 5 per cent., it will be found very difficult to use in the producers, and difficulty may be experienced in getting a ready sale for the coke.

These items of moisture and ash in coke play a very important part in the selection of coal; and I consider that it is only with practical experience in testing and carbonizing coals that due allowance can be made for these items when valuing coal with a small test plant. With a large test plant on a practical working scale, these items can be taken into account without any difficulty; and this is one of the many points where the large test plants have a decided advantage over the small ones.

In these days of high carbonizing results, I consider the question of the relative valuation of coals should be seriously considered. There is a great temptation to purchase coals which give high carbonizing results, in order to be "in the running," as it were, with those who are able to obtain high yields. But it should be borne in mind that high carbonizing results are not everything. The financial results are what should be considered; and while one manager may be able to procure coal at practically the retort-house door which would give high carbonizing results, it would probably be unwise, from a financial point of view, for a manager (say) 50 miles away to buy the same coal in order perhaps to get a few hundred cubic feet of gas per ton carbonized more than he was capable of obtaining from coal in his own locality. High carbonizing results are desirable when they can be obtained with financial success.

Discussion.

The address having been thrown open to discussion,

Mr. ALEX. WILSON (Glasgow) said he was sure it gave them all very much pleasure to see their new session started so auspiciously. Their last session was certainly a great success; and he thought they might look forward to a greater success this year, if such a thing were possible. He did not know any part of a gas-works where exact methods of working and of observation were more necessary than in the testing-house. The President in his address had given full details of coal testing. The foundation of the business they might naturally suppose would be the testing plant; but he did not think so. He believed the foundation of coal testing was the coal sampling. Unless this was carefully done, and in a systematic manner, the best testing plant anyone could have might give inaccurate results. Everything, in the first instance at any rate, depended on the sampling. A good testing plant was what everyone ought to have. At the same time, suppose the plant to be not correct in every detail, if it were carefully handled, and the sampling were done in a systematic manner, the results would be comparative for that works; and he thought this was really what was wanted. They did not want to value the coal for the sake of other people, they wanted to value for themselves; and if the plant were always used under similar conditions, and the sampling were also done under similar conditions, they should expect to have the coal tested in such a way that, for their own undertaking, they would get comparative results. The values of the different constituents, as stated by the President, differed in a great many ways from theirs in Glasgow. But he was not going to criticize that circumstance very fully, because it was just possible that Stirling methods might be better than theirs. It was essential that carbonizing costs should be taken into consideration, especially in large works, where a great variety of coal were used. Where coal was employed for the higher qualities of gas, of course, they were tied down in a manner to one class of coal; but when they came down to lower qualities of gas, they had a much larger field to draw upon. If they used the coal which was lying to their hand, and made the necessary corrections for the carbonizing costs, then they got fairly near the value of the coal to them. The moisture in the coal was a most important matter for consideration. He had always said, against some authorities who dried the coal to a certain extent, that all their coal should be tested as received, because, unless they did this, they did not get the value of the coal to them. The ash in the coke was also a very important matter. He must congratulate them if they were able in Stirling to get a coke with no more than 5 per cent. of ash in it. He would be very glad if he could get down to an average of even 10 per cent. They had to put up with that, but he could assure the President that coke, if it were well handled, though it might contain 10 to 12 per cent. of ash, was quite saleable. They got rid of a lot of such coke during the year. To those who were near the coalfields, it was much more economical to buy the coal they could get, because if they obtained only an average result, the cost would be correspondingly low.

Mr. L. HISLOP (Uddingston) supposed it was round coal which was taken at the standard of 11s. per ton; but if they took the small of this same coal, such as the pearls, it would require to be bought at a matter of 3s. per ton. These pearls would give practically the same results on a small scale; but when they came to carbonize on a large scale, they would be of a rather different value. So far as they knew, there were very few coals in Scotland which gave 2 or 3 per cent. of ash, which, of course, was 5 per cent. in the coke.

Mr. A. SMITH (Tradeston) had noted the remark about the percentage of ash in coke, which seemed to him to be very low. It was difficult for him to get down below 10 per cent.; and in many cases it was 15 or 20 per cent. The table the President had prepared was altogether new to him, in the way in which the different items were stated. The coal-testing plant at Tradeston was capable of dealing with a thousandth part of a ton—that was, 2·124 lbs. The coal was selected from the waggon by a chemist who was well acquainted with this class of work. Perhaps 3 cwt. would be taken at a time. It would be thoroughly mixed on the floor, and then sampled when the occasion arose for testing. Four tests were made. The first was a clearing test for the apparatus; and the other three tests were put into the record, the average of the three being what they considered the value of the coal. The coal was tested four or five times during the year; so that they were always on the look-out to see that it was according to contract. It was of the greatest importance to a gas manager to know the materials he was dealing with. Coal varied from time to time; and it was occasionally not easy to convince the coal merchant that the coal was not what it should be, and that the waggons contained something else than coal.

Mr. J. NAPIER MYERS (Saltcoats) said he made a note of the statement that the coke was allowed to cool in the atmosphere,

and was not quenched with water. He did not think a sample of coke which was to be analyzed should be so violently treated. It ought to be quenched as soon as possible, because combustion went on for a very long time. They would find that heat was given off considerably; and therefore weight would be also given off. He did not mean to say that the coke should be weighed with a considerable quantity of water in it, but that it should be suitably dried, and then weighed. Besides the volume of ash in coke, they had to give some attention to the character of the ash. The inert matter in some coal included clayband, or ironstone, which was apt to flux on and adhere to the bars, and made the operation of clinkering difficult. This was a subject which, especially in works with small producers, required careful attention. The President had set forth an elaborate and complete system of testing coal, where they had a testing plant; but some of those present would probably be connected with gas-works in which there was no testing plant, and in which it would be equally as important that they should exercise great care in the selecting of their coal. He happened to be in a works where they had no testing plant. Probably Mr. Wilson and some others might consider that his whole works was merely a testing plant; and he so treated it in summer time, when they were reduced to one or two ovens. His earliest method of selecting coal was to take, in all honesty and simplicity, those analyses which were submitted to them; and he tried to make a rude selection from his practical knowledge of those coals of which he had had some previous experience. He would try to find a common co-efficient, and to have that expressed in the sperm value of the coal. At Saltcoats just now, this was about 0·15 per pound of sperm. In this way, he tried to find out the coal which was likely to give him the best value. But he discovered that some of the statements were so fictitious that, of late years, he had had to abandon the system; and he preferred now to get sample waggons in summer time of the coal he was likely to select. He also experienced some difficulty in making the samples fair samples for testing. He used to trust to the stoker who weighed out the coal; but the stoker, when he knew that a test was being made, thought a record was wanted, and not a test. Nowadays he generally weighed the coal twice, and generally laid down as much coal as would go over the plant twice—once to sweep out all the gas in the plant, and the second to have the test run. In this way, he had fairly satisfactory results. Then these results he compared with the results from one coal which they had used very frequently in Ayrshire—continuously, he might say, for a large number of years, and which he considered their standard. This coal he put down at 100. He took the market value of it, and he judged all the other coals in comparison with it. If the results were better, that was shown in a better percentage. If they were poorer, there was a corresponding fall below the standard unit.

Mr. D. Vass (Airdrie) said that Mr. Myers had described pretty much his (Mr. Vass's) method of testing coal. He put the whole works on the test; and in this way he got a practical test, taken from month to month. During the time of making contracts, he occasionally put the whole works on a coal for (say) eight hours —one coal only, and sending the whole of the gas into one holder, and testing it by itself. This had to be done where they had no testing plant; but he also thought it was a very good check test where they had a testing plant. In the plant described, the retort was heated by gas. It would be a very good check to measure the gas that was used, in testing one coal with another. They might, in this way, arrive at the cost of carbonizing coal—an approximate cost, of course—which would be a very useful figure in any works; and also they would get at the question of the extra cost of carbonizing coal that contained a great percentage of moisture.

Mr. A. M. M'Leod (Dawsholm) made the suggestion that, seeing the trend of the gas industry was towards heavy charges and increased time for carbonizing, it might be time that laboratory testing should follow, and let them see whether they could get an increased yield of gas, equal to perhaps 1000 cubic feet per ton. The President reported his make of ammonia in pounds per ton. Would it not be better to report it in (say) pounds of sulphate per ton? He knew that in the chemical works at Dawsholm, over the whole year, they made about 29 lbs. of sulphate per ton of coal carbonized, and expressed it so.

Mr. J. Webster (Provan) desired to call attention, in the matter of the valuation of coal, to the importance of screening the coal, so as to free it from dirt, if they were to get good carbonizing results. In their works, the machines were fed from a high hopper, with the result that the large coal ran to one side and the small coal to the other—the side next the retorts. In the first feed they were able to put in only about 5 feet. As they went further, they were able to get in 6 and 7 feet; and when they came to the round coal, they could put in as much as 9 feet. Supposing the small coal was of equal value with the round coal in the testing plant, it would not be so economical to use it on a large scale, seeing they could only get a little over 2 cwt. of small coal into a retort, whereas they could get 4 or 5 cwt. of large coal in.

Mr. W. Wilson (Falkirk) remarked that the address was upon a subject which exercised the mind of every gas manager. In Falkirk, they had a testing plant very much on the same lines as in Glasgow. He did not say they went into the matter so elaborately as they did in Glasgow; but one or two items they attended to. Among these were the ash and the moisture, and last, but not least, the commercial value of the coke as produced in their large retorts and their machines. The fact of their getting more round coal into a retort than small coal, as mentioned by Mr. Webster, he found to be a very determining factor in the selection of coal. Indeed, during the past year or two, they had had to restrict themselves to the purchase of nuts. Round coal they had had to crush up; and what was the good of buying coal to crush it? They confined themselves almost entirely to the use of nuts. With nuts, there was practically no breakage between the waggon and the retort; and, barring weather such as they were having, the percentage of moisture did not affect them materially, though at the present time it was doing so. In ascertaining the value of coal, they took samples of the coke as produced and classified it, having regard to the amount they expected from a particular ton of coal. In a small testing plant, they did not get a proper idea of the value of the coke. He had noticed frequently that the nuts of a coal gave a better coke than did the round of the same coal. He attributed that to this—that when they charged with nuts, the nuts lay very much closer together than did the particles of the round coal, and were therefore more ready to intermix and fuse together. It was a matter of considerable importance for them to remember that they usually entered upon their coal contracts in the early summer, and that therefore the tests were frequently made in the dry weather of summer.

Mr. Walter Grafton (Glasgow) pointed out that no description was given of the condenser used, and he failed to see any statement as to the quantity of liquor obtained per ton. The President said he used a graduated counterbalanced gasholder. He did not wish to criticize the paper adversely; but he wanted to see how he obtained the make of gas per ton which he did. The holder was of 11 cubic feet capacity. From the quantity he used, he could not get more than 11,000 cubic feet per ton; and yet, in every instance, he quoted more than 11,000 cubic feet per ton. The retort was heated by gas. If it were heated by coke produced from the coal being tested, they would see the value of the coke as a fuel. If they were using a coal which gave a bad heating coke, down would go their heats, and all the other evils attendant upon small makes would naturally arise. The value of the coke was well brought out in the address; but they wanted to know the value of it as fuel, apart from its selling value. He presumed that oxide of iron was used in the purifiers. Might he ask if the oxide was new, or had been used before, because this would very much influence the quality of the gas. He noticed that the holder was set at even gauge during the time the testing was in operation. Perhaps the President would bear him out that, when the charge was put in, there might be 5 inches of pressure, and at the end of the test no pressure at all.

Mr. A. H. Whitelaw said that, coming from the same works as the President, he had every confidence in the figures which had been placed before them. As an Association, they had the pleasure, two years ago, of visiting the gas-works at Stirling; and he thought it was a unanimous expression on their part that the works were among the most up-to-date, for their size, which they had ever visited. Although a good many of them there had not had much experience of this work, still they could understand that the paper was a good one; and if they ever found themselves in the fortunate position of being managers of gas-works, they probably could not do better than have these tables beside them. They appeared to him to be among the best he had ever had the privilege of reading. The President's conclusion was that coal No. 3 was the best. He would like to throw out the suggestion that in that case they had a higher yield per ton of coal; but they had a candle less in illuminating value, and consequently had to enrich the gas. This would naturally point to him that the best course to follow, if they had a choice of coal, would be to take the one which gave the higher yield and enrich the gas. He thought the President had made a point for the introduction of carburetted water-gas plant. It would be well to look into this. They had there the cheapest coal giving the highest yield; and though it was the lowest candle power, the President had proved to them that it paid to enrich.

Mr. J. Fraser (Provan) said his experience had been confined to Glasgow; and this being so, he had had no opportunity of testing coal, because this duty was allocated to the chemists and assistants. But it fell to his lot to have the coal under observation daily; and, as Mr. Webster had said, they were very often troubled with the small kind. The observations made about dirt in the coal applied to them also. Beyond regular testing in the laboratory, there should also be careful observation of the coal before it was carbonized, as the one was no good without the other.

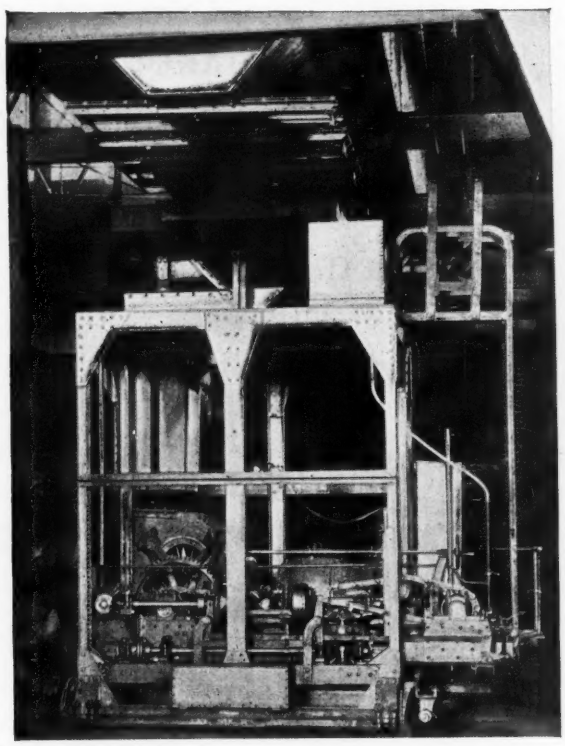
Mr. P. M'Dougall (Helensburgh) considered that the President had treated upon a polemical subject of great importance to gas engineers. There was no standard means of testing coal—each engineer simply proceeded along whatever lines appeared to him to afford the most accurate results. Consequently, they had a great many different ways of valuing. He was satisfied, however, that a small laboratory plant, taking a thousandth part of a ton of coal, was of little use in arriving at the value of a coal to the gas manufacturer. It had been proved that different tests of the same coal in the same plant yielded results which did not agree; and it was not fair to assume that 2·24 lbs. represented a fair average sample of coal from bulk. This was easily noticed, both from the yield of gas and from the varying quantity of ash in the residual coke. In a plant of this type, a test could be worked off much quicker; and while the figures might be far from representing an average sample of the coal, they assisted in forming an opinion as to the various kinds of coal being used. He believed

A RECORD FROM SCOTLAND

THE MACHINE

TO

FILL YOUR GASHOLDERS



DEMPSTER'S STOKING MACHINE.

STIRLING RETORT-HOUSE.

See "JOURNAL," Aug. 3, 1909, Page 309.

11,787 cubic feet of **STRAIGHT** 18-candle Gas per Ton of **SCOTCH** Coal.
32 lbs. of Sulphate of Ammonia .... ,, ,, ,,
10½ cwt. of large Coke sold .... ,, ,, ,,
No Naphthalene.
No Stopped Pipes.
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CONTINUOUS CARBONIZATION

IN

VERTICAL RETORTS

GLOVER-WEST PATENTS.

Extracts from Tests made by

Dr. HAROLD G. COLMAN

at the St. Helens Gas-Works

DURHAM (THORNLEY) COAL.

Gas made per Ton	13,102	cubic feet.
Fuel Consumption	12·3	lbs. per cent.
Illuminating Power	15·56	No. 2 Met. Burner.
Calorific Value	573·6	B.Th.U. (Gross).

YORKSHIRE (SILKSTONE), BARROW COLLIERY.

Gas made per Ton	12,435	cubic feet.
Fuel Consumption	13·4	lbs. per cent.
Illuminating Power	16·19	No. 2 Met. Burner.
Calorific Value	584·9	B.Th.U. (Gross).

LANCASHIRE, WIGAN (ARLEY MINE).

Gas made per Ton	12,145	cubic feet.
Fuel Consumption	12·2	lbs. per cent.
Illuminating Power	15·22	No. 2 Met. Burner.
Calorific Value	576·2	B.Th.U. (Gross).

See "JOURNAL OF GAS LIGHTING," June 8 & July 20, 1909, for description and results.

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that the best method of testing coal, in order to arrive at its value to the gas manufacturer, would be to have a setting of (say) six or eight retorts, heated by furnaces of the same type as those in every-day use, with the usual purifying, scrubbing, condensing, and measuring apparatus. To provide this plant would mean extra capital expenditure; and he was afraid that, except in the larger works, it would be out of the question. However, in small and medium-sized works, he did not see any reason why the coal under test could not be used exclusively throughout the retort-house. This was the method now adopted at Helensburgh. If a coal were carbonized under the most favourable conditions, and provided the distillation products were not allowed to be superheated, a fixed yield of gas could be obtained from a particular coal, which would approximately always have the same calorific value. This quantity of gas, multiplied by the calorific value, would give a figure which would represent the valuation figure of the coal. Account should also be taken of the quantity of oxygen in the coal, because the more oxygen present the lower the yield of gas and coke. The oxygen, again, reappeared combined in the tar, and in the form of water which went to make up the liquor, or as carbonic oxide or carbonic acid in the gas. This brought out the fact that a coal rich in oxygen was of less value to the gas manufacturer than one containing comparatively little oxygen. Mr. Hislop, of Paisley, told them that it had always been his practice to test all coal with a content of water equal to two-thirds the total water-bearing capacity of the coal. He agreed that some such basis was necessary. But would it not suit the purpose as well if the coal were air-dried? In testing samples of some of the well-known Lancashire coals, he had found a difference in the same season from the same pit, more particularly in the yield of gas and the percentage of ash in the coke. This showed that it was necessary that an average sample should always be taken. Mr. Hislop worked his valuations out on the sperm-value basis, which was not of much importance now, considering that in most places the illuminating power had been reduced by, in some instances, half what it formerly was, and that calorific power was of more importance now, although it did not necessarily follow that a coal high in sperm value would yield a gas of a high calorific value.

The PRESIDENT thanked the honorary and senior members for their attendance that night. He said, in the discussion, Mr. Wilson mentioned the importance of sampling the coal aright. In his address, he (the President) said the taking of the sample was one of the most important points in coal testing. Mr. M'Dougall referred to getting different results from the same coal. Of course, seams differed; but a great deal depended on the time. If there had been a long period between the testing of two samples, there must be a difference; but taking two samples out of one waggon, he did not see how there should be a great difference if the tests were carried out exactly alike. He had never known, in such circumstances, any great variation in coke or in ash. Mr. Wilson bore him out in saying that carbonizing costs should be taken into consideration. This would determine to a great extent the value of different coals where hand stoking had to be taken into consideration. If they had one coal yielding 9000 cubic feet of gas per ton, and another yielding 11,000 feet, there would be a great difference in the number of retorts which would be required to work both kinds. The more retorts the more men; so that a difference would require to be allowed. In valuing coal, the question of moisture in it was a very ticklish one. The coal they tested was usually air-dried, as Mr. M'Dougall had said. They did not immerse it in water to the extent of two-thirds of its water-holding capacity. At the same time they from time to time tested the coal as they got it in the waggon, and thereby obtained an idea as to what the working results would be. Mr. Wilson had made reference to the percentage of ash in the coke. In Stirling the largest percentage was 4·8, and the lowest 2·2. Mr. Hislop dealt with the use of pearls; and Mr. Wilson, of Falkirk, also touched on this point. He did not think it was possible to get the same quantity of gas per ton out of nuts as they got out of round coal—at least, he had never been able to obtain it in Stirling. As a matter of fact, they did not get 20 cwt. of nuts in a ton—they had always a certain quantity of water. In comparison with round coal, they would need to get nuts about 2s. 6d. per ton cheaper. Mr. Myers dealt with the testing of coal in the works retorts in summer. This method, in a small works, was often better than testing in a testing plant in large works. The results should be more reliable than with a testing plant. The same remark applied to Mr. Vass's observations. Mr. Vass said it would be interesting to know the quantity of gas used in heating the retort. He never thought of that; but he would carry out the suggestion. Mr. M'Leod asked why not adopt heavy charges in testing plant? In Stirling, they had adopted heavy charging; and it was practically in the laboratory where the heavy charging started, not in the retort-house. It did not matter whether the ammonia return was stated as sulphate or not—they could adopt either method of stating. Mr. Webster had spoken of experiencing some difficulty on account of the coal flowing better towards the end of a run. In Stirling, they were not really bothered by this. They could put in either dross or round coal equally well. It was just a question of the speed of the machine. The coal-breakers might have something to do with this. The condenser used was simply a rectangular hose, with a number of iron tubes through it. The holder had only capacity for 11 cubic feet; but they had two holders, and the gas could be put into either. When they got as much as 10 cubic feet into one holder, they could open the other and put in the remainder. After the test was over, they blew out part of the gas in the 11 feet holder, so as to get the gas into the other one, as being the gas of the charge. The oxide in the purifiers was not new; it was simply taken out of the bing of oxide used for the ordinary purifiers. The holder did show a pressure immediately after the charge. But there was always a workman standing by, at the valve of the holder; and when the charge was put in, the door was closed and the inlet to the holder was opened simultaneously. He might explain that the liquor he dealt with was the liquor from the four tests, and the product divided by four. Mr. Whitelaw dealt with coal No. 3 being the one which gave the best value—of course, taking enrichment into account. This gave them an idea as to whether it was better to use a coal which was giving a high yield of gas or otherwise. So long as it was kept within certain bounds, he was inclined to think that, invariably, the coal which gave the most gas per ton was really the cheapest. Mr. Fraser was quite right—no matter what results they got in the laboratory, they could not expect to get the same results in the retort-house, unless it were practically under the same supervision. Mr. M'Dougall remarked about tests varying. Of course, they varied a little; but they got them fairly approximate when they took the samples of coal correctly, and conducted all the tests in the same manner. He thanked them for their kind attention to his address, and for their discussion of it.

Mr. J. BELL (Kirkintilloch) moved a vote of thanks to the President for the way in which he had conducted the proceedings, and for the very valuable contribution he had made to the "Transactions" of the Association.

This was cordially agreed to.

THE GOLD MEDAL.

The PRESIDENT intimated that the gold medal for the best paper read during the past session had been awarded to Mr. G. H. M'Cowat, for his paper on "Distribution of Gas: Main Laying." The medal would be presented at the annual dinner.

The meeting then terminated.

PROGRAMME FOR THE SESSION.

The syllabus for the session contains the following items after that of last Saturday: Nov. 6, paper by Mr. T. Orr, of Motherwell, on "Carbonization Fifty Years Ago." Nov. 20, visit to Greenock Gas-Works. Dec. 4, paper by Mr. F. L. M'Laren, of Dumbarton, on "Producers and Internal Combustion Engines." Dec. 18, annual dinner. Jan. 8, paper by Mr. V. M. Evans, of Glasgow, on "High-Pressure Gas Distribution." Jan. 22, visit to the colliery and coke-ovens of Messrs. William Baird and Co., Limited, at Bedlay, near Glenboig. Feb. 5, paper by Mr. D. T. Marwick, of Dawsholm, on "The Chemistry of Coal Gas and the Bye-Products." Feb. 19, visit to Broxburn Oil-Works. March 5, paper by Mr. G. M. Smith, of Dumfries, on "The Manufacture of Sulphate of Ammonia." March 26, joint visit to Falkirk Gas-Works. April 2, general business meeting, and lecture by Mr. Walter Grafton, of Glasgow, on "Gas Combustion."

Estimation of Carbon Bisulphide in Benzol.—A recent issue of the "Chemical Trade Journal" contained a reference to an abstract, in the "Chemiker Zeitung," of a paper by Herr I. M. Weiss on the estimation of bisulphide of carbon in benzol. Of the sample taken, 2·5 grammes are mixed with 2·5 c.c. of saturated alcoholic potash; and the flask containing the mixture is attached to a reflux condenser. After allowing it to remain at the room temperature for five minutes, the mixture is heated to 60° C. on the water bath, and kept at this temperature for an hour. The whole of the sulphur of any carbon bisulphide originally present will now be combined as potassium xanthate. This is oxidized to sulphate by means of bromine, after expelling unchanged benzol by diluting with water and boiling, and the sulphate determined, as usual, by precipitation with barium chloride after acidifying with hydrochloric acid.

A New Gas Examiner Appointed by the Dublin Corporation.—In the "JOURNAL" for the 12th inst., it was stated that Mr. Henry F. Cotton, son of the late Mr. Thomas J. Cotton, had been recommended by the Lighting Committee of the Corporation of Dublin as successor to his father as Inspector of Public Lighting, Meter Inspector, and Gas Examiner for the City of Dublin. The recommendation was adopted, and the appointment has been made. As Mr. Cotton is only twenty-one, he has reason to congratulate himself on being entrusted with duties so responsible as those appertaining to his office. He seems, however, to be perfectly competent to discharge them. He spent a year under his late father in Dublin, and then went to Liverpool, where he was articled to Mr. C. J. M'Ewen, the Manager of the Linacre works of the Liverpool Gas Company. After serving four years with him, he was appointed General Assistant on the staff of the Company by the Chief Engineer, Mr. Edward Allen; and he was acting in this capacity when he was called back to Ireland on his father's death. While at Liverpool, he had the opportunity of being engaged in extensive tests on one of the first installations of Woodall-Duckham retorts. In addition to the highest references from Mr. Allen and Mr. M'Ewen, Mr. Cotton holds several certificates—among others, three granted by the City and Guilds of London Institute.

ILLUMINATING ENGINEERING IN EUROPE.

[A Paper by Mr. H. Thurston Owens.]

In the notice of the recent annual meeting of the American Illuminating Engineering Society which appeared last week in the "JOURNAL," it was mentioned that Mr. H. Thurston Owens contributed a paper on "Progress of Illuminating Engineering in Europe." The author has sent a print of his paper, of which the following is an abstract.

Coming to the actual subject of this paper, Mr. Owens remarked that the profession of illuminating engineering is still in its infancy abroad, just as it is in America; but the almost universal use of modern high-power luminants has made it evident that the sooner the services of impartial practitioners are obtained, the greater will be the benefits for the greatest number. High-pressure upright gas-lamps were installed for public lighting in Berlin less than ten years ago; but they are to be changed to the inverted type, as they have become obsolete. In America, neither type has been used at all, except in one or two minor instances. The lamps used for lighting the homes to-day were those employed for public lighting yesterday; so that one may predict with fair accuracy that present-day public lamps will soon find their way into buildings.

Americans have heard much of the superior street lighting to be found abroad; but nevertheless Mr. Owens thinks one would have to be decidedly *blasé* not to be forcibly struck by the profusion of lights and the high intensity of the illumination involved. London is divided into a large number of boroughs, and each is apparently trying to outdo the other in providing the best street illumination possible, regardless of expense, with the result that there are all kinds and conditions of lamps hung in almost every conceivable manner. Mr. Owens informed his colleagues that this subject had been recently investigated by a Committee of the Corporation of London, and said their report was a valuable addition to lighting literature.

Referring to Berlin, the author remarked that there is probably no city in the world where the results of active and intelligent illuminating engineering in public lighting are so manifest. The gas-works there are operated by the Municipality, who have brought forward the very best lamps they could find in order to satisfy the taxpayers that the results are better than could be obtained by means of the latest designs in electric lamps. Just now, gas has the better of it; there being some 800 electric arc lamps against about twice this number of high-pressure gas-lamps, and if the present plan is completed the whole city will be lighted by gas-lamps within five years at an expense of 7,000,000 marks. With regard to Paris, Mr. Owens thinks it is fast becoming an echo of the past. Low-pressure gas and open arcs no longer produce an effect in keeping with her *sobriquet* of the City of Light; for people judge by comparison. The author summed up, as follows, the principal differences between Europe and America, in the minor details of the practice in public lighting: Circular or boulevard globes on gas-lamps are unknown abroad; but the lack is made up by the use of reflectors, which have been entirely neglected in America. The following types of lamps are used abroad with great success, but have not made any headway at home: Inverted low and high pressure gas-lamps, and vertical and inclined carbon flaming arc lamps.

Speaking of interior lighting, he remarked that when comparing the lighting conditions abroad, it must be remembered that the spirit of competition between the two great luminants, gas and electricity, is much keener there than in America. Gas is used for many purposes and in many instances abroad which are given over to electricity in the majority of cases at home. The result is that gas-fittings are an ornament rather than an eyesore. This is especially true in Germany, where *l'art nouveau* is in great favour, and rightly so, to judge from the beautiful effects obtained. In glassware, other than the very handsome installations, Americans have not very much to learn, as the new high-efficiency lamps which have been used to replace the older types are, as a rule, somewhat larger and do not fit the old glassware. The matter of maintenance receives much more care and attention abroad than is bestowed upon it in America; and broken mantles or dirty bulbs are the rarest exception. The indictment against America on account of having sources of high candle power in the line of vision, must also, Mr. Owens thinks, be made against Europe, especially in the large cities. Europe has anticipated America in the use of these modern lamps; but the latter has anticipated the former by spreading a deeper and better understanding of their use and misuse.

In conclusion, Mr. Owens said: It is indeed fortunate that illuminating engineering has made a strong foothold in America, at a time in advance of the general use of light sources which are a great menace to our eyesight unless properly used. We are making history in lighting to-day; and it behoves us to get together and make history which is worthy of our best efforts. The old luminants will soon be replaced by the new; and we, as illuminating engineers, have a magnificent opportunity to obtain, for the present generation and the generation to come, conditions which will not only tend to conserve our natural resources through the intelligent use of lighting appliances, but also to conserve and protect perhaps better the physical vision of our fellow-beings.

REGISTER OF PATENTS.

Hydraulic Mains.

PARKER, T. & C. H., of Wednesfield.

No. 20,178; Sept. 25, 1908.

This invention relates to the hydraulic mains of apparatus employed for the destructive distillation of coal and other substances, and "especially to such apparatus as is used for the destructive distillation of coal at low temperatures"—say, "Coalite." It has for its object "to provide improved apparatus for sealing the dip-pipes of retorts, and further to provide simple and effective means for the ready removal of tar or pitch that may be condensed in the hydraulic main, and to provide such an arrangement as to permit of the convenient periodic cleaning and flushing of the tar-main for the complete removal of any deposit."

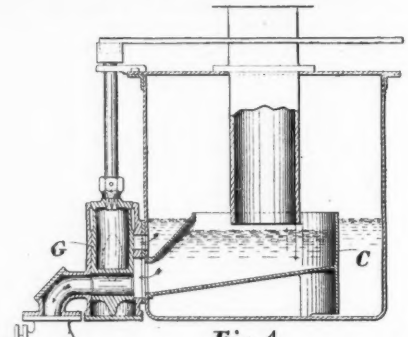
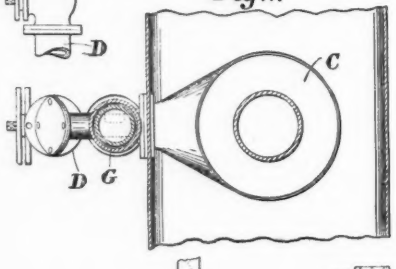


Fig. 1.



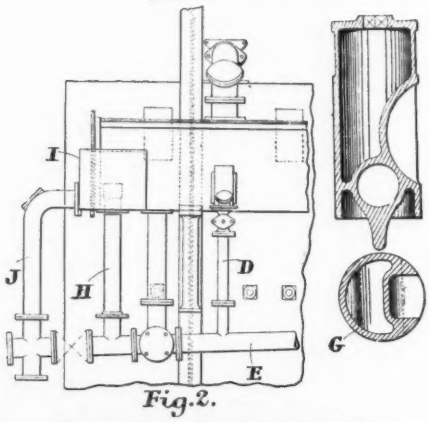


Fig. 2.

Parker's Hydraulic Main Arrangement.

Fig. 1 is a sectional side elevation and sectional plan of a hydraulic main showing the dip-pipe, sealing dish, and valve in position—the valve being opened for normal working. Fig. 2 is a front view showing the hydraulic main and receiver, with sections of the plug-valve.

The hydraulic main has a number of downwardly protruding dip-pipes, through which the gases from the retorts are led. There are sealing dishes C in the hydraulic main, in a position coincident and surrounding the lower ends of the respective dip-pipes, with a passage leading from them through communicating pipes D to the tar-main E, which is at a slightly lower level than the hydraulic main and adjacent to it. At the side of the hydraulic main a number of plug-valves G regulate the outlet from the sealing dishes and from the main. The dishes have their upper edges at one common level.

The valve-plugs are so constructed that in the position shown in fig. 1 (for normal working) communication is made from the sealing dishes to the tar-main; while, when the corresponding retort or "bunch of retorts" corresponding to the dip-pipe is to be isolated, the valve is so turned that communication is made between the dish and the lower part of the hydraulic main containing the liquor, so that the level in the dish rises substantially to the normal level of liquor in the main, and the dip-pipe is sealed.

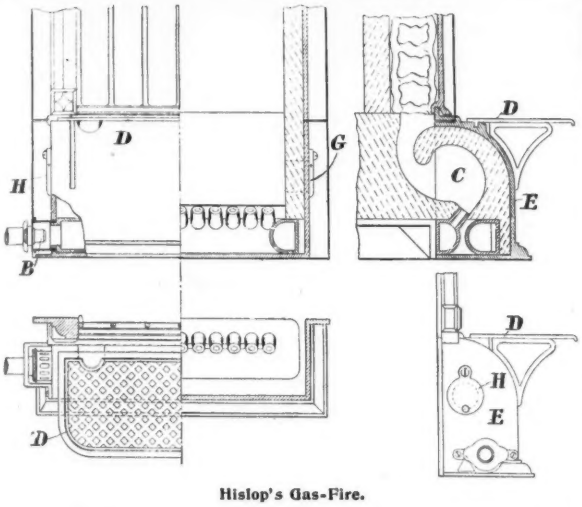
The level of the liquid in the sealing dishes is determined by means of an upstanding pipe H, which extends into a receiver I; and its extremity may be provided with means (such as a socket) by which it may be extended so as to alter the normal level of the liquor in the sealing dishes, and thus the main may be worked with a sealed or unsealed dip-pipe as required. The receiver is constructed of glass, so that the rise of the tar may be seen. The tar passes out from the tar-main through the outlet pipe J of the receiver.

Burners of Gas-Fires and the Like.

HISLOP, G. R., of Paisley.

No. 23,657; Nov. 5, 1908.

This invention relates to gas-fires, gas-cooking stoves, gas-heated radiators, water-heaters, or the like, where a mixture of gas and air issues from a chamber having a number of outlet nozzles and is passed through a combustion chamber in which the inner surfaces of the walls are curved away from one another and are brought closer together towards the outlet, so that the gas-air mixture is caused to take a sinuous path prior to contacting with the article to be heated. The invention consists in "combining with the combustion chamber or chambers a gas and air mixing chamber or chambers of a known type."



Hislop's Gas-Fire.

The illustration shows the arrangement of devices applied to a gas fire or stove.

A is the mixing-chamber, which is of the kind wherein the supply of gas and air passes along a branch or branches prior to issuing through the burner-nozzles. The gas is supplied to the mixing-chamber by a jet B, and the air is admitted by a regulator as usual; the chamber having a gas and air inlet at one end (as shown), or having a gas and air inlet at each end, in which case the chamber is provided with a partition. The mixture of gas and air passes along branches provided with inclined nozzles, from which the mixture issues and is ignited within, and impinges against, the inner surfaces of the walls of the reverberating or gyrating combustion chamber C. This is preferably enclosed by a casing E, the walls of which are curved apart and are brought closer together towards the outlet, "so that the ignited mixture of gas and air is caused to take a sinuous path prior to making contact with the article to be heated, whereby, with the gyrating and scrubbing action induced, absolute combustion of the gas is obtained and the heating effect is intensified." The white-hot gas-flame thus produced passes through the outlet of the gyrating chamber to raise to incandescence artificial fuel or iron frets or to heat other articles. In the ends of the casing are sight and lighting openings provided with covers G and H; and over the casing a trivet D is provided for supporting utensils the contents of which are to be heated. The casing, projecting as it does in front of the gas-fire proper, "radiates a considerable amount of heat into the apartment; while it is serviceable for heating and boiling purposes."

Removing Carbon Bisulphide from Coal Gas.

MAYER, M., and FEHLMANN, A., of Carlsruhe, Germany.

No. 174; Jan. 4, 1909.

The methods hitherto used for the removal of carbon bisulphide from gases, particularly from coal gas, have the drawback (the patentees say) that the reaction between the carbon bisulphide of the gas and the purifying agents is too slow; so that a long time is required for the purification of the gas. The present invention has for its object to accelerate the reaction, by treating the gas with a mixture of amines and insoluble metal oxides or metal salts—*i.e.*, metallic oxides or salts which are insoluble in alcohol, oil, such as petroleum or amines.

Accordingly, when using metal oxides, the reaction is effected in such a way that the carbon bisulphide, the metal oxides, and the amines combine to form alkaldithiocarbamic acid salts, which are formed as an intermediate product prior to the development of the sulphuretted hydrogen. This intermediate product is formed so rapidly that the carbon bisulphide present in the gas is almost instantaneously removed in the form of such intermediate product, which has the property of forming slowly, with excess of amine, substituted thiourea, metal sulphide, and sulphuretted hydrogen—the latter escaping quantitatively. The same effect as is obtained with metal oxides can also be obtained with metal salts; but this method is said not to be an economical one, as the reaction is generally slower, and, besides, the consumption of amines is considerably larger owing to the formation of a compound with the acid remainder of the metal salts.

The final products of the reaction consist essentially of substituted thioureas and of their derivatives—such, for instance, as triphenylguanidine and metal sulphides. From the thioureas (hitherto of no value) the amines can be recovered by heating the waste mass with such metal hydroxides—for instance, hydroxide of iron—as will enable the regeneration of the amines to take place.

For the purpose of the present invention, the amines which come into consideration are of the aliphatic and aromatic kind—for instance, phenylamine (aniline, toluidine, xylidine, &c.), while the oxides may be any metal oxide or peroxide—for example, oxide of mercury, peroxide of lead, minium, lead oxide, oxide of copper, oxide of manganese, hydroxide of iron, or oxide of calcium.

The invention may, in practice, be carried out in the following manner: A washer (of any kind) is charged, for instance, with a mixture of finely powdered bog iron ore and aniline—the two substances being mixed, for instance, in a proportion of 500 grammes of bog iron ore to 1500 grammes of aniline. The gas is washed with this mixture. As, owing to substituted thioureas separating out, the mixture becomes thicker, it is necessary to either add suitable quantities of aniline or to so carry out the washing operation that the mixture traverses the washer continually on the counter-current principle. The waste sediment containing thioureas, guanidine, and metal sulphides (besides unchanged hydroxide of iron) is filtered, and mixed with hydroxide of iron, in the proportion of 300 parts by weight of filtered sediment to 200 parts of hydroxide of iron. The mixture is slowly heated to about 350° C., in which operation about 80 per cent. of the aniline, which was present in the form of thioureas, &c., is driven off. The residue in the retort remaining after distillation consists of pyrophoric sulphide of iron and sulphur.

Instead of effecting the purification in a wet manner as described, it may also be carried out in such a way that metal oxides are impregnated with amines.

As regards the arrangement of the washer in the gas-works, it is preferably placed behind the sulphuretted hydrogen purifier, or between the third and fourth purifiers.

Removing Carbon Monoxide from Gases and Replacing it by Hydrogen.

JOHNSON, G. W.; a communication from the Chemische Fabrik Griesheim-Elektron, of Frankfort-on-the-Maine.

No. 2523; Feb. 2, 1909.

It has been proposed to remove carbon monoxide from water gas, the patentees point out, by causing it to be absorbed by a solution of cuprous chloride and calcic carbide, or by liquefaction (see "Zeitschrift für Calciumcarbidfabrikation, Acetylen-und Kleingasbeleuchtung," Vol. II., 1907, part No. 41, p. 322). But these methods are said to be "troublesome and costly." The present invention consists in "an improved process for freeing water gas, or other gases, from carbon monoxide in an extremely simple and economical manner, whereby a perfect replacement of the carbon monoxide by hydrogen is effected with very efficient utilization of the reagents employed."

The process consists in passing the gases over heated calcium oxide, or heated calcium hydroxide, while steam is blown into the reaction chamber; the temperature being kept below the temperature of dissociation of calcium carbonate. Experiments have already shown that when carbon monoxide is passed over calcium hydroxide, the carbon monoxide disappears and hydrogen is produced (see "Berichte der Deutschen Chemischen Gesellschaft," 1880, Vol. I., p. 718); but in these experiments, steam was not passed over the calcium hydroxide along with the gases. The patentees have found that the introduction of steam is absolutely necessary in practice, because at the temperatures under which the reactions take place, a large portion of the water of the hydroxide is uselessly distilled, so that the calcium oxide, or calcium hydroxide, is "very inefficiently utilized." They have also found that when steam is not introduced, although the carbon monoxide is at first replaced by hydrogen, after a short time the carbon monoxide disappears without the production of the equivalent amount of hydrogen, because, in consequence of the lack of water, carbon is separated as such in accordance with the equation:

$$CaO + 2CO = CaCO_3 + C.$$

The reaction given in the "Berichte der Deutschen Chemischen Gesellschaft"—namely, $Ca(OH)_2 + CO = CaCO_3 + H_2$—takes place properly only when an excess of steam is present.

The operation may be considerably accelerated by an admixture of metal—apparently because this admixture facilitates the decomposition of water.

The following example will illustrate how the invention is worked. Water gas containing 40 per cent. of carbon monoxide and 50 per cent. of hydrogen, and heated to about 500° C., is passed, together with steam, in a suitable apparatus—for instance, a retort with a stirring apparatus—over calcium oxide, or calcium hydroxide. The carbon monoxide disappears and calcium carbonate is formed; while, at the same time, for each molecular proportion of carbon monoxide a molecular proportion of hydrogen is split off from the steam, as well as from the water which separates from the hydrate.

As a considerable amount of heat is evolved during the process, extraneous heating is not required after the process is started; there being, indeed, an excess of heat, which, if necessary, is removed, so that the temperature in the reaction vessel is always below the temperature of dissociation of calcium carbonate (preferably 500° C.). The superfluous heat may be employed to evaporate the water required for the reaction, or be utilized for any other operation requiring heat. The reagent is always regenerated. If iron powder (about 5 per cent.) be added to the calcium oxide, or calcium hydroxide, the operation is said to be greatly accelerated.

Caustic lime has before been employed for the production of hydrogen from water gas; but this has been done, it is claimed, in a manner quite different from the process according to this invention, and is unprofitable. It is known that if water gas be produced at low temperature a mixture of hydrogen and carbon dioxide, with but little carbon monoxide, is obtained. This carbon dioxide has then to be absorbed by caustic lime in order to obtain approximately pure hydrogen. This method is unprofitable, because the process has to be kept going by the application of external heat which is costly; and there is very poor utilization of the steam blown in (see, for instance, "Handbuch der Chemischen Technologie," by Dr. F. Fischer, 1900, Vol. I., p. 48, and Haber's "Thermodynamik Technischer Gasreaktionen," p. 121). This process need not, however, be considered here, it is pointed out, especially as it is suitable only for the removal of carbon dioxide and not of carbon monoxide.

The advantages which the process in accordance with this invention,

for the removal of carbon monoxide, have over those hitherto known are therefore: (1) that for each molecular proportion of carbon, two molecular proportions of hydrogen are obtained in accordance with the equations:

$$C + H_2O = CO + H_2 \text{ (water-gas process)},$$

and

$$CO + H_2O + CaO = CaCO_3 + H_2;$$

whereas, according to the processes first mentioned, only one molecular proportion of hydrogen is obtained for each molecular proportion of carbon; (2) oxides, or hydrates, are used as absorbing agents; (3) the absorption process yields a considerable amount of heat; and (4) the absorption agent can be easily regenerated.

Automatic Ignition of Illuminating Gas.

Société Charles Lubeck, and Payet, M., of Paris.

No. 3171; Feb. 9, 1909. Date claimed under International Convention, March 5, 1908.

This invention relates to a catalytic material for the automatic ignition of illuminating gas and to a process for producing the material.

Among the oxidized cobalt ores, the patentees state, the hydrated oxide of cobalt, known under the name of asbolite or earthy cobalt, contains about 30 per cent. of oxide of manganese (MnO) to be eliminated and 20 per cent. of oxide of cobalt to be utilized (CoO), and the rest of what is found mixed therewith is composed of impurities, "and more especially of a certain moisture arising from its hydrothermal origin." For the separation or isolation of the oxide of cobalt from this oxide of manganese, after having removed its moisture by calcination, the best process to be employed is the electrolytic one. However, as there exist in commerce oxides of cobalt of 70 per cent. originating from calcination in the air of the hydrated peroxide or of the carbonate, their reduction is more economical for an industrial business. The present process of reduction is effected by heating in a vacuum a mixture of oxide of cobalt in powder (CoO) with cuprous chloride in powder (CuCl – CuCl); this latter remaining insoluble in pure water, but capable of being dissolved by hydrochloric acid. The ensuing result is that there is obtained after the treatment of the mixture by a reducing gas, and afterwards by hydrochloric acid, a double chloride of cobalt and copper. When the cobalt is afterwards attacked by hydrochloric acid in a liquid state, the cuprous chloride will be dissolved finally by the hydrochloric acid; the double chloride of cobalt and copper falling into a receptacle filled beforehand with natural or artificial pumice-stone, or any other magnesium silicate—the whole forming a magma and a liquor.

After cooling, the mass and liquor are applicable for the automatic ignition of any burner provided with a mantle impregnated with oxides of rare earths. The liquor will serve for tracing with a brush several lines called "excitative" (excitatrices) in the presence of illuminating gas escaping in front of the meshes of the mantle. Or else it can be wholly or partially steeped in the liquor—that is, the mantle be made by woven or isolated threads impregnated with the oxides of rare earths. Afterwards the mass, which will be composed of the double chloride of cobalt and of copper and of the deposited silicate, will, with a little water, serve for the manufacture of a lozenge, which is caused to adhere to, and dry on to, the tissue of the mantle, or to wires of variable forms. Wires thus prepared may be placed on top of the chimney or near the bunsen burner. Consequently, directly the burner tap is turned, the illuminating gas takes fire, due to the property possessed by the double chloride of cobalt and copper of becoming incandescent in the presence of hydrogen or carburetted hydrogen.

In many processes where use has been made of platinum, this latter was often oxidized, it is said, in a short time by moisture, which rendered it unsuitable; but this drawback does not occur with the present invention.

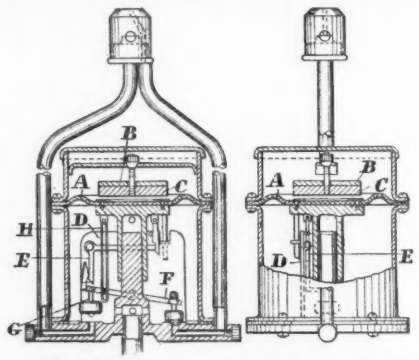
Automatically Lighting and Extinguishing Street-Lamps.

Bedford, A. J., of Melbourne.

No. 4333; Feb. 22, 1909. Date claimed under International Convention, Oct. 15, 1908.

This invention relates to street gas-lamp lighting and extinguishing devices in which different pressures, regulated by governors at some central station or the gas-works, operate a flexible diaphragm enclosed within a cylindrical metal casing attached to, and between the burner and the gas supply pipe of, the lamps. The object of the invention is to cause the flexible diaphragm and adjustable loading weights to automatically operate so as to cause the weights to occupy predetermined positions for admitting gas by predetermined variations of pressure through passages to the burner, and for the simultaneous extinguishing of the pilot light—the same means also providing for automatically extinguishing the burner light, cutting off the gas supply to the lamp burner, and simultaneously lighting the pilot light.

The cylindrical casing (as shown) is comprised of two separable sections with flanges, between which is inserted a flexible weighted diaphragm A. The compartment below the diaphragm is employed as a gas-cylinder, in which are contained the various parts of the valve mechanism, which is operated to either admit or shut off the gas supply to the lamp burner or pilot light. Where it is required that a certain number of lamps should remain lighted after other lamps have been extinguished, the suspended loading weights B C are made to occupy a higher position in the upper compartment; and extra loading weights are added upon the top side of the diaphragm for further resisting its upward movement, according to the pressure conditions under which the lamp is to be lighted and extinguished. A vertical plate D is provided with a bottom flange secured to the bottom end cover of the casing; and on it is pivotally mounted, on a projected stud, a bell-crank lever E, the arms of which are of two different lengths, proportioned in weight, in order that the long arm will be heavier than the short one, and thus, after the valve operating mechanism has shut off the gas supply to the burner, it will open the supply of gas to the pilot light. On the vertically depending arm of the bell-crank lever is a projecting lift catch which engages a catch extended upwardly from one end of the pivoted rocking lever F, from one side of which project two lugs, in each of which an elongated hole is formed. In one hole is pivotally mounted the upper end of the valve-stem G, to the bottom end of which is attached the burner gas-outlet valve, to engage the seat of the lateral gas-port leading to the gas-outlet passage. The stem of the pilot-light valve is fitted to move freely in the other elongated hole of the lug, and is provided at its top end with an adjustable conically-shaped milled nut, and at its bottom end with the pilot-light valve, which engages the seat of a lateral gas-port leading to the gas-outlet passage provided in the bottom cover for the pilot light.



Bedford's Automatic Lamp Lighter and Extinguisher.

In using the device for street lighting purposes, the gas is introduced at a maximum pressure of (say) 45-10ths of an inch, to operate the parts of the valve mechanism to the "first position"—that is, for lighting the burner and extinguishing the pilot light. As the gas is admitted it passes into the cylinder and lifts the flexible weighted diaphragm A, which co-operates with the suspended loading weights B C and the slidable spindle. The upward movement of the diaphragm brings the lower end of the slotted link H into lifting engagement with its pin, thereby actuating the pivoted rocking lever F and simultaneously raising the burner outlet valve, so as to allow gas to pass into the gas-outlet passage and thence to the burner. The same upward movement of the diaphragm places the valve-operating mechanism in the "first position," previously referred to, while the rock movement imparted to the pivoted rocking lever F shuts down the pilot-light valve upon its seat, and prevents the exit of gas to the pilot-light tube. The suspended trip pawl, as it moves upwardly, is also diverted outwardly, to occupy a disengaged position; while the catches of the bell-crank lever and the rocking lever engage with each other. The maximum gas pressure thus retains uplifted the diaphragm and valve operating mechanism in the position for lighting purposes from sunset to midnight or thereabout, when the maximum pressure is reduced to a minimum pressure of (say) 18-10ths. In this case, the lower end of the slotted link H slides inoperatively past the pin of the rocking lever F, while the trip pawl slides downwardly against the fixed guide-pin until its notch engages with the free end of the bell-crank lever E, for suspending the valve-operating mechanism in the "second position" as shown. The gas is maintained at the pressure of 18-10ths until daylight, when it is increased to 25-10ths, to partially uplift the diaphragm A, so that the valve-operating mechanism will be released to occupy the "third position," where the catches are freed from each other, and the trip pawl is disengaged from the bell-crank lever E to permit of the burner gas-outlet valve closing the port for extinguishing the burner light, and allowing of the raising of the pilot-light valve and the opening of the gas-port for the supply of gas to the pilot light for simultaneously lighting it.

Burners for Incandescent Gas-Lamps.

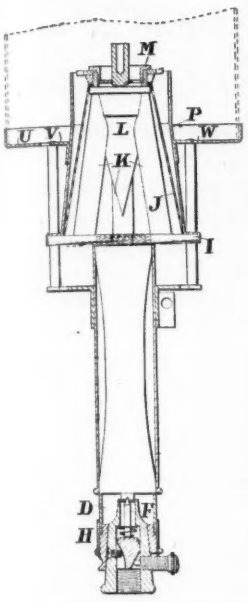
Welsbach Incandescent Gaslight Company, Limited, and Ruler, W., of Wimbledon.

No. 6542; March 18, 1909.

This invention relates to Kern gas-burners, and more particularly to the larger forms of such burners, suitable for street lighting. It has for its object such a construction of burner that "a flame is produced of sufficient size to light the mantle equally without the employment of a multiplicity of burner-tubes and at the same time give an efficient light at ordinary gas pressures."

Heretofore, in constructing burners of the type referred to, the patentees point out, it "has been found necessary to provide a number of bunsen tubes in order to obtain a flame of sufficient size to illuminate the mantle. With such an arrangement difficulties are met with in regulating the supplies of gas and air to each of the separate bunsen tubes so as to obtain an even light. The present invention consists in the provision of means for supplying air to the centre of a burner of the type indicated supplied with a mixture of gas and air by a single bunsen tube in such a manner that the flame produced is caused to spread so as to illuminate the mantle around its whole circumference."

In carrying the invention into effect according to the form illustrated, there is provided, as is usual in Kern burners, a double truncated cone burner-tube surrounded by a cylindrical casing and connected to it at its upper end. The lower end of the tube is provided with ports D, forming the air-intake for the bunsen burner and screws into a socket mounted upon a nozzle containing a needle valve F, for regulating the gas supply and provided with a screw thread for connection to the gas-supply pipe (not shown). The amount of air taken in at the ports D can be regulated by means of a sleeve H, screwed upon the socket; while to the upper end of the burner-tube is screwed a flange I, upon



A Modified Kern Street-Lamp Burner.

which rests a perforated cone J. Within this cone are three tubes K, converging into an inverted cone-shaped chamber L, to convey air from the outside of the burner cylinder. "A device comprising converging tubes for the purpose of leading a central air supply to a gas-burner is not in itself new, and the same does not form the subject of the present invention."

Screwed into the top of the chamber is a cap M, provided with ports for the passage of the central air supply of the burner and a socket for the mantle support rod. A hollow cone P, having a rim with hooked projections, is placed upon the flange I, and is fixed to it by the engagement of the projections with the underside of the flange. The slots are provided so that the cone can be removed by being turned round into such a position that the projections register with the slots.

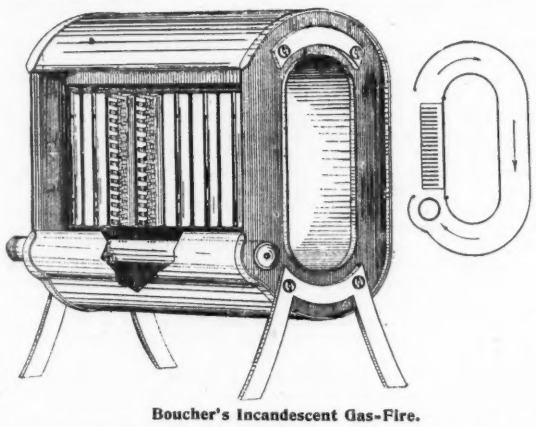
A serrated washer is placed (as is usual in this type of burners) on the top of the cone, and provides the requisite circular passage of the mixture of gas and air between its edge and the inside of the cone. The gallery which carries the chimney support U is of a diameter to allow of an annular air-passage W, between its inner edge and the outer edge of a flanged ring V, placed around the cone P. This air-passage can be regulated by raising or lowering the gallery in relation to the flanged ring.

Incandescent Gas-Fires.

BOUCHER, A. L., of Asninères, France.

No. 7815; April 1, 1909. Date claimed under International Convention, Sept. 7, 1908.

This invention relates to gas heating-stoves and the like "where no discharge shaft is employed and the partially consumed gases are led back to the burners, where they undergo further combustion after circulating through a heating-chamber." The products of combustion circulate in a heating-chamber comprising an annular casing through the centre of which the surrounding air can pass, and afterwards the partially consumed gases join the incoming mixture of air and gas at a point below the burners, whence they flow in a direction parallel to the burner flames on to and around "incandescent radiating members comprising removable and interchangeable metallic elements arranged above the burners."



Boucher's Incandescent Gas-Fire.

The apparatus comprises a double casing formed of two end plates to which are connected side walls comprising two metal sheets between which is left an annular circulating chamber. The front portion of the walls is cut away to form two rectangular openings, the front one of which constitutes the mouth of the radiator. The rear opening is closed by a removable cast-iron plate, which engages projections of the end plates and is provided with nickel plates or flanges riveted thereto and adapted to serve as vertical guides for removable and interchangeable metallic radiating members mounted above the burners.

Carbon Monoxide in Gas.—In the House of Commons last Thursday, Mr. George Roberts, a Labour member, asked the Home Secretary if his attention had been directed to a case of carbon monoxide poisoning arising from the fumes of the gas now largely employed for heating the metal-pots attached to linotype composing machines, and whether he would cause an inquiry to be made with a view to the disease being scheduled under the Workmen's Compensation Act. Mr. Gladstone said the case to which the honourable member had referred appeared to be one of gradual poisoning by carbon monoxide. Such cases were extremely rare; and not another of the kind in connection with linotype work was known to the Department. The question of scheduling carbon monoxide poisoning as a disease was considered by the Industrial Diseases Committee; but they were unable to regard the evidence as sufficient to justify their recommending its inclusion. In view, however, of the case mentioned, he would give instructions for the matter to be carefully watched by the officers of the Department.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Illuminating Power of Vertical-Retort Gas.

SIR,—Owing to absence from home, my attention has only just been directed to the remarks made by Mr. John Young, on vertical retorts, in the course of his excellent inaugural address to the Eastern Counties Gas Managers' Association at Hull last month.

Mr. Young said that the illuminating power of the gas made in vertical retorts on the Continent is only 10 to 12 candles. He, however, made no mention of the fact that this is a result obtained where steaming is resorted to. Where steaming is not resorted to, there is no difficulty in maintaining higher candle powers. In proof of this, I may remind him of the report of the Carbonizing Committee of the Institution of Gas Engineers (signed by Mr. A. E. Broadberry and Dr. H. G. Colman), in which is mentioned, as one of the advantages of this system, "the satisfactory average yield, the purity, and the lighting and heating value of the gas"—this being supported by the average yield of a three days' test of 11,410 cubic feet per ton of 16·10-candle gas (No. 2 burner) and a net calorific value of 540 B.Th.U.

At the Genoa Gas-Works, as pointed out in my letter to you of June 24 last, the average production by this system is upwards of 12,000 cubic feet of 14-candle gas (No. 1 burner). Nor can it have quite passed out of mind that Mr. Hayman, when closing the discussion on the paper which he read last year before the Institution of Gas Engineers, gave, as the result of an extended trial, a yield of 14,522 cubic feet of 14·59-candle illuminating power (No. 2 burner) with a calorific value of 559 B.Th.U.

It is, of course, quite true that the Dessau system of vertical retorts lends itself to the production of high yields of what we are accustomed to term low-grade gas—the gas in all probability of the future; but it is equally true that it is capable of satisfying, with unsurpassed economy, the ordinary candle power requirements of to-day.

17, *Victoria Street, S.W., Oct.* 19, 1909. CHARLES HUNT.

The St. Helens Vertical Retort Results.

SIR,—In your issue of Sept. 28 appears a letter from Dr. H. G. Colman, commenting upon an article by me; and while that letter is a vindication of the attitude taken in the article—viz., that complete information was necessary for estimating the value of a new process—it raises a question to which perhaps a reply may be expected by some of your readers.

Dr. Colman, after admitting that I was obliged to make an assumption before I could compile a balance-sheet, says "he has taken the water yield as 29·6 gallons in the first case and 21·7 gallons in the latter. Such figures would, if true, certainly be very abnormal—especially the former—and in point of fact are much above the actual yield in both instances." As to this remark, while thanking Dr. Colman for supplying a missing link—viz., the virgin liquor—it may be asked, Where was the writer's unreasonableness in assuming 10 gallons of scrubber water per ton of coal?

Further, Dr. Colman's figures leave the matter of total ammonia liquor in some uncertainty, for they *apparently* lead to the following deduction:—

	Test No. 2.	Test No. 3.
Total ammonia liquor *equivalent* to 10 ozs. liquor	406 lbs.	325 lbs.
Virgin liquor	141 lbs.	121 lbs.
Leaving ammonia liquor unexplained	265 lbs.	204 lbs.

The words apparently and equivalent are italicized because probably they afford a clue to the misunderstanding; for in the original report the ammonia liquor is stated as an equivalent and not as an actual quantity realized. That mode of statement does not, however, conduce to a clear comprehension of the water production. Certainly no gas engineer would have assumed anything like these figures of 265 and 204 lbs. respectively for the scrubber liquor, and they are much less antecedently probable than 29·6 and 21·7 gallons of virgin liquor; for with coal washed or from a wet seam these figures may be reached.

The remainder of Dr. Colman's letter refers to experimental difficulties that exist, which he fears cannot be overcome. However, as knowledge of a disease is often half way towards a remedy, the writer is at work endeavouring to assess the magnitude of their influence.

I have to acknowledge the kindness of Dr. Colman and Mr. John West in furnishing me with some further useful facts relative to the various tests of the interesting installation at St. Helens.

5, *Victoria Street, S.W., Oct.* 25, 1909. THOS. HOLGATE.

German v. English Gas-Retorts.

SIR,—The letter signed by Mr. Charles Carpenter, in your last issue, is of considerable interest to myself, and, no doubt, to other retort manufacturers in this country, who are asked: When will the British manufacturer use "brains" in compounding his retorts? The writer has been trying to do this for some time; and Mr. Carpenter was good enough, a few months ago, to put in a sample bed of retorts which had been made on different lines from those usually followed in this country. I venture to hope he will pay some attention to these retorts, to see if our exercise of "brains" has resulted in the production of a British retort which is equal to any made in Germany or elsewhere.

I would remind Mr. Carpenter that the selling price of retorts in Germany is about double that obtained in this country, which may or may not account for the supposed better retort made there. I do not know whether the German makers are told in Germany, as we are told here by many engineers, that the only way to obtain orders is to quote the lowest price. I have not found much enthusiasm among engineers

to encourage me in producing a better, and consequently a more expensive, retort than has hitherto been in use. Something cheap, and the cheaper the better, seems to be in request.

JOSEPH MORTON,
Managing-Director, Joseph Morton, Limited.

Halifax, Oct. 20, 1909.

English Gas-Works Orders for Continental Firms.

SIR,—Doubtless many will have read with surprise Mr. Carpenter's letter in the last issue of the "JOURNAL." Apart from the placing (just now) of one of the most powerful political levers in the hands of those who care to add their whole "Budget" of weight and strength on the "long leg" of the lever, Mr. Carpenter might tell us if the present order for retorts is the first one given to a German firm by the South Metropolitan Company. If it is not, then why has no mention been made of the orders "gone before"? There is apparently aptness even in Time.

T. SETTLE.

Exeter, Oct. 21, 1909.

Scientific Methods of Manufacturing Gas Appliances.

SIR,—I have been particularly interested in reading the article in the Oct. 19 issue of the "JOURNAL," bearing upon scientific methods as applied to the manufacture of gas cooking and heating appliances; and I should like to express my very cordial agreement with the opinions to which you give voice.

At the same time, may I point out that my Company have for many years realized the importance of scientific research work; and when our new works at Luton were built, and we were no longer restricted in the matter of space, considerable scope was allowed to the special department dealing with this section of our business. In spite of this fact, however, our laboratories have recently been so overtaxed that it has become necessary to extend them very considerably.

This particular department is under the charge of a fully qualified gas engineer and staff. The extensions, we expect, will be completed by the end of the year, when our present scientific appliances will be considerably augmented.

CYRIL G. DAVIS, Managing-Director,
Davis Gas-Stove Co., Ltd.

Luton, Oct. 23, 1909.

Gas Coal from Nova Scotia.

SIR,—I can quite believe, as stated in the article on the above subject in the last number of the "JOURNAL," that the Dominion Coal Company of Nova Scotia would not, for a contract of 100,000 tons or upwards, consider a price lower than from 9s. to 10s. per ton f.o.b. at Sydney or Louisberg, because they have a practical monopoly of the trade at these ports; but this would not prevent other mines being opened by the gas companies themselves for their own supply, and so getting the coal f.o.b. for 5s. 3d. The profit made by the Dominion Coal Company is certainly more at the present time than the difference between 5s. 3d. and 9s. or 10s. Other coal companies are now in process of formation, and there are other coalfields to be had; and if the gas companies coalesced with some of these promoters and proprietors, they could get the coal f.o.b. at almost cost price, which would be even less than 5s. 3d. per ton, especially if they did so on a profit-sharing basis with the miners, like the South Metropolitan Gas Company.

EDMUND KIMBER.

15, *Walbrook, E.C., Oct.* 20, 1909.

[Our correspondent holds that the prices quoted by the Dominion Coal Company carry about 100 per cent. profit. We have no figures by us to affirm or to contest his statement. But he suggests that other companies are in course of formation with which British gas undertakings could enter into agreements for the supply of gas coal at about 5s. 3d. or below per ton. When the provision of large ships to carry the coal is considered, and the cost of transmission and handling is added, there would be many occasions when home market conditions would cause regret that a gas undertaking was saddled with such a contract. There is, too, the unknown future. Present arrangements might be entered into, with new coal companies, on a satisfactory basis; but there is no assurance as to the future. It is morally certain that their plans would be subject to the retaliation of existing companies. A low export price would mean a low price in Nova Scotia; and we should look very dubiously upon the new companies being in a position to absolutely direct the course of market conditions as suggested. Mr. Kimber does not deal with the three practical points as to the large vessels that would be required to bring the coal to this country from Nova Scotia, the cost of conveyance (which is rather more than he originally estimated), and the dangers besetting regularity of delivery from such a distance. Buying coal from so far away would detract from the purchaser's power of control, and from the opportunities for accelerating dispatch, such as obtain when the seat of supply is much nearer the point of consumption. In gas making, regularity of coal delivery is an important factor in economical working. In making these remarks, we should not like it to be thought that there is any opposition on our part to a cheap supply of coal from abroad. What we want to get at is, would it really be cheap, and are there any considerations that for gas-making purposes would need to be weighed against a lower cost?—ED. J.G.L.]

The Bingley Urban District Council have decided to appoint a deputation to wait upon the Bradford Gas Committee and ascertain the lowest price for the purchase by Bingley of the rights of gas supply at Wilsden.

LEGAL INTELLIGENCE.

CONSTRUCTION OF UNAUTHORIZED WATER-WORKS.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Oct. 19.

(*Before Lords Justices* VAUGHAN WILLIAMS, BUCKLEY, *and* KENNEDY.)

Attorney-General v. Barnet District Gas and Water Company.

This was an appeal from the decision of Mr. Justice Ridley, granting an injunction to restrain the Barnet District Gas and Water Company from sinking a well at Colney Heath for the purpose of obtaining an additional supply. The proceedings in the Lower Court were reported in the "JOURNAL" for July 13 (p. 125).

Mr. BALFOUR BROWNE, K.C., Sir ROBERT FINLAY, K.C., and Mr. J. D. CRAWFORD (instructed by Messrs. Bannister and Reynolds) appeared for the appellants; Sir ALFRED CRIPPS, K.C., Mr. DANCKWERTS, K.C., and Mr. EUSTACE HILLS (instructed by Messrs. Nicholson, Patterson, and Freeland) represented the respondents.

Sir ROBERT FINLAY, in opening the appeal, said it raised two questions. One was the construction of the Private Act authorizing the Company to carry out certain additional works for the purpose of obtaining water; and the other—which only arose if he were wrong on the first point, and bore on the discretion of the Court in granting an injunction—related to an agreement entered into while the Bill was going through the Committee, which showed that the intention of all parties to the agreement was clearly that the clause in question should give the Company power to do that which the relator was now seeking to restrain them from doing. He proposed first of all to address himself to the construction of the Statute; and he hoped to fully satisfy the Court that Mr. Justice Ridley was wrong in thinking that the authorities cited on the other side (chiefly the Frimley and Farnborough case*) had any bearing on this particular matter. The question referred to a piece of land at Colney Heath, which was substituted, during the progress of the Bill, for a plot at Little Berkhampstead that was originally contemplated. He relied, in the first place, on section 12 of the Water-Works Clauses Act, 1847, which was incorporated with the Private Act, and gave power to the undertakers, among other things, to sink wells or shafts, and erect buildings, &c., for the purpose of supplying water. It was held in the Frimley case that the incorporation of the Act of 1847 in any Special Act did not authorize a company to sink wells except in accordance with the provisions of the Special Act in regard to where they should be sunk. This was the authority on which Mr. Justice Ridley proceeded; but he (Counsel) was going to submit that, having regard to the words of the Special Act in this case, the decision had no application. It was decided by Mr. Justice Swinfen Eady, and confirmed by the Court of Appeal, that the power to sink wells must be read along with the terms of the Special Act authorizing certain statutory water-works; and if by the Special Act only wells at particular points were sanctioned, the power conferred by section 12 could not have any application to other pieces of land which a company might acquire under their Act, but without reference to the construction of wells. The Barnet Company's Special Act of 1904 incorporated in section 3 the Water-Works Clauses Acts, 1847 and 1863, in general terms; but in section 10 there were express words to the effect that the Company might, on all or any of the additional lands to be acquired under the Act, execute, for the purpose of, or in connection with, the water-works, any of the works, and exercise any of the powers, mentioned in, or conferred by, section, 12 of the Act of 1847. He submitted that this section authorized the sinking of wells on the land therein referred to. This construction was strengthened by some of the following clauses. For instance, section 11 was introduced for the protection of the county of Middlesex; and it provided that no well should be sunk on any land acquired in that county. Section 12, which was similar in general character, dealing with the county of Hertford, did not forbid the sinking of wells; and it seemed to him plain that if there was no power at all to sink wells, it was quite unnecessary to refer to them in section 11. The learned Counsel went briefly over the remaining sections, then read Mr. Justice Ridley's judgment, and submitted that his Lordship was mistaken in thinking that this case was covered by the Frimley decision.

Lord Justice KENNEDY asked what use the land at Colney Heath would be to the Company if they could not sink a well.

Sir ROBERT FINLAY replied none at all. The Company would have to get an amending Act if the judgment appealed against were sustained. He thought it would be as well to have this question of construction decided before dealing with his second point.

Sir ALFRED CRIPPS assented, and proceeded to open the respondents' case. He submitted, with regard to the construction of section 10, that the principle of the Frimley case was decisive, and that Mr. Justice Ridley was perfectly right in applying it. The principle of that case was that Parliament did not give a water company a roving power to make a well anywhere they pleased, but only power to construct the authorized water-works, and supply water from them; the reason being that persons might not have their rights with regard to water affected without having notice, and having the opportunity to protect themselves. A deep well might affect people many miles away. This was why, in such cases, the Attorney-General intervened on behalf of the district generally. There was also the question of the nature of the water to be supplied. If a company were allowed to obtain it wherever they thought fit, they might procure it from a contaminated source. He submitted that there was nothing in the appellants' Act which gave them what would be quite an abnormal power, such as was entrusted to no other water company. Counsel then proceeded to comment on the various sections of the Act, and on the judgments in the Frimley case, to show that the powers conferred by section 12 of the 1847 Act only applied to the authorized works of the Company.

* See "JOURNAL," Vol. CI., pp. 636, 843.

Lord Justice VAUGHAN WILLIAMS asked what was the present source of supply.

A discussion of some length ensued as to the source of supply indicated by the Company's original and subsequent Acts, one of which (that of 1887) contained a section almost identical in terms with section 10 in the Act of 1904, under which, it was said, three wells had been sunk.

Sir ALFRED CRIPPS said it might be that some of the existing works were really unauthorized. Until the Frimley case was decided, there was a general impression that section 12 of the Act of 1847 entitled water companies to sink wells on any lands they might acquire.

Sir ROBERT FINLAY, in reply, again submitted that the Frimley case was no authority for the present one, the circumstances being so entirely different. He invited their Lordships to look at the original Act of the Frimley Company, in which the source of supply was specifically pointed out; whereas in the Barnet case there was power given in the various Acts of the Company to execute any of the works mentioned in section 12 on any of the lands they then held or might acquire under the Acts.

Wednesday, Oct. 20.

Sir ROBERT FINLAY resumed his reply this morning, and read the relevant sections from the appellant Company's Acts of 1872, 1883, and 1887, in the last of which section 16 was almost identical in terms with section 10 of the Act of 1904; and under it the Company had sunk wells. It was inconceivable that when, in 1904, the Legislature found that the existing wells had been constructed under the powers of the earlier Acts, and reproduced the language of section 16 of the Act of 1887, they did not intend to authorize doing again what had been done already. The learned Counsel proceeded to read from the judgments in the Frimley case, both in the Court below and in the Court of Appeal, to emphasize the point that the circumstances of that case were entirely different from those of the present.

Sir ALFRED CRIPPS asked leave to say something with regard to the points raised on the earlier Acts of the Barnet Company which had been referred to first in reply. He submitted, in substance, that the Acts did not carry the matter any further, and that the wells constructed under the Act of 1887 were also *ultra vires*.

Judgment was reserved.

THE WELSBACH COMPANY'S TRADE MARK.

Clerkenwell Police Court.—Saturday, Oct. 23.

(*Before Mr.* BROS.)

His Worship had before him a summons taken out by the Wolfram (Tungsten) Metal Filament Lamps, Limited, against the Welsbach Incandescent Gaslight Company, Limited, for having sold and exposed goods to which a false trade description had been applied.

Mr. RUFUS ISAACS, K.C., M.P., Mr. H. A. COLEFAX, and Mr. ERNEST LUNGE appeared for the prosecution; Mr. A. H. BODKIN and Mr. WALTER represented the defendants.

Mr. RUFUS ISAACS, in opening the case, said the summons was issued under the Merchandise Marks Act, 1887, against the Welsbach Company, for selling and exposing goods to which a false trade description had been applied; the acts relating to three specific days—viz., the 22nd and 29th of September and the 8th of October of the present year. The Company was incorporated for the purpose of dealing with the inventions of Baron Auer von Welsbach, the inventor of the incandescent gas-mantle now so generally in use. He (Counsel) was not concerned, in any of the summonses, with what had happened in relation to gas lighting. He wished, however, to state that the association of the defendants with Baron von Welsbach was entirely in relation to gas lighting, and had no connection whatever with electric lighting. Baron Welsbach's gas inventions were acquired by a German Company, known in this country as the Auer Company; and they subsequently acquired an invention of his in relation to electric lamps, of which the filament was of metal instead of carbon, which had practically ruled the market. The metal of which the filament was made was called "Osram;" and the lamp was designated the "Osram" lamp. Inventors had apparently been devoting a considerable amount of attention to finding some means of making a metal filament which would be commercially useful; and Baron von Welsbach had succeeded in doing it. But this was never in any way, either as an invention or as a manufacture, acquired by the Welsbach Company. The rights in it were acquired by the Auer Company, who, by agreement, appointed the General Electric Company, Limited (an English Company), as the exclusive agents for the sale of the lamp. After a little time there was an invention which might be described as of great practical commercial utility, which consisted, among other things, of using for the filament a metal known as "Wolfram," or "Tungsten," which appeared to be a cheaper or commoner kind of metal; the result being that it became at once a very useful and most valuable means of making metal filament lamps. The Osram lamp was then made of wolfram or tungsten, under the invention of the Auer Company, who introduced the Osram lamp into this country. It was important to bear in mind that the Auer Company was the pioneer introducer of the metal filament made of tungsten. The German Company appointed at first the General Electric Company as their sole exclusive agents for the purpose of disposing of the Osram lamps in England; and subsequently, under the new Patents Act, a factory was established and lamps were manufactured of the metal by a Company known as the Wolfram (Tungsten) Metal Filament Lamps, Limited, who had the exclusive right of sale of the Osram lamp. Consequently, there was a large consumption and a great demand for it. This lamp, made of tungsten, was not the invention of Welsbach, and had nothing to do with him, except that he had first invented a metal filament lamp of a different make. Also, the Welsbach Company had nothing to do with these electric lamps, either with Welsbach or with the Auer Company. On the 27th of September this year, there was a full page advertisement in the "Daily Telegraph;" and it was repeated on subsequent days in other well-known newspapers, which bore the words "Welsbach" and "AUR" and the words: "Remember that the electric metallic filament lamp was invented by Baron Welsbach, and see that the trade mark 'AUR' appears on every lamp." Counsel contended that this statement, taken in conjunction with the lamp shown in the picture, was calculated to lead persons to believe that the lamp which the Welsbach Company were then offering was one which had been either invented or manufactured by Baron Welsbach or the Auer Company, which was also associated with Baron Welsbach's invention. On the 29th of September, Mr. Hale went to the Welsbach Company's premises, in Gray's Inn Road, and asked the young lady attendant for some lamps as advertised by the Company, and she produced some. He asked if they were Baron von Welsbach's lamps, and she said "Yes." Thereupon he went to another room, where the salesmen were, repeated the question, and received the same answer. He purchased the lamps, and paid 5s. 5d. for them. On the 8th of October, Mr. Hale went again to the Company's premises and purchased additional lamps; and he (Counsel) desired to call attention to the invoice given with them. It bore the words "Baron von Welsbach." This document was, he submitted, a statement by the Company that the lamps they were selling were invented or manufactured by Baron von Welsbach, which was untrue. The "AUR" was a trade mark which the Company had used. But whether or not they had the right to use it in connection with electric lamps was, he submitted, dealt with clearly under the Patents Act; and it could not be a defence to say that that trade mark was on the register.

Formal evidence of registration having been given, the case was adjourned.

A summons issued against Mr. Laurence Fletcher, the Managing-Director of the Welsbach Company, for "having caused the false trade description to be applied" was also adjourned.

TICEHURST AND NEW TODDINGTON GAS COMPANIES.

Receivers Appointed.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Joyce, Mr. Hughes, K.C., and Mr. Hurrell (instructed by Mr. M. J. Jarvis) appeared in the case of *Locke v. Ticehurst and District Gas and Water Company*. Mr. Hughes said it was a debenture holder's action; and he moved for the appointment of a receiver and manager; the interest being in arrear. There was no question about the right to a receiver; but the Company being a statutory one, he was afraid there was a difficulty about getting the further relief asked—viz., the appointment of a manager. It was an unfortunate case, and probably it would be better for everyone concerned if a manager could be appointed. Mr. Kirby, who (instructed by Mr. Barnes) appeared for the Company, said he was afraid his Lordship had no power to appoint a manager—only a receiver of the rates and tolls. Mr. Justice Joyce said there would be the usual order; the statutory management would still continue to act, as he could not turn them out. Mr. Hughes said it was very unfortunate, because the Directors had not called any meetings, or rendered any accounts for several years; but he was afraid nothing more could be done. His Lordship said in these cases there was a common form of order which would be followed.

The case of *Goodson v. New Toddington Gas Company* was also before his Lordship; the action being on behalf of the debenture holders. No one appeared for the Company, and an order was made as in the preceding case.

Damages for Malicious Prosecution.

At the Lambeth County Court last Tuesday, Alfred Highmore, of Avondale Square, Old Kent Road, sued the South Metropolitan Gas Company to recover £50 damages for alleged false imprisonment and malicious prosecution. Mr. Hastings, who appeared for the plaintiff, said that on the latter's premises was a slot-meter, and it was the practice of the plaintiff, as also of other people, when they found they had not a coin of exact size, to cut a piece of metal, which was simply put into the meter for the purpose of working it. When the Company's official came, and it was found that the amount was short, the difference was paid. The plaintiff, however, was charged with stealing the money, and was committed for trial. But at the Quarter Sessions, he was discharged without any witnesses being called. Judgment was given for the defendants, with costs.

Claim against the Gaslight and Coke Company.

At the Woolwich County Court last Wednesday, his Honour Judge Willis had before him a case in which Arthur Robert Hodgkins sought to recover from the Gaslight and Coke Company compensation, under the Workmen's Compensation Act, for injuries sustained while in their service. Claimant was working on a hydraulic charger on the 16th of February, and had to stand on a stool. He stated that the stool slipped and he fell a distance of about a yard. Only one of his feet touched the platform on which the charger stood—the other remaining on the stool; but that leg was twisted, and he was unable to continue his duties. He went back and tried on more than one day to work, but finally had to leave off, and was not able to do anything. His Honour awarded applicant £12 18s. 9d. compensation.

Gas Explosion at Tranmere.—A house at Lower Tranmere was much damaged by a gas explosion last Sunday week, and Mrs. Hill, the tenant, received injuries which necessitated her removal to the hospital. On the evening of the accident, Mrs. Hill's son detected a strong smell of gas in the parlour. He went into the room, opened the window, struck a match, and immediately there was a violent explosion, which, it is conjectured, was caused by a defective pipe within the walls allowing of an escape of gas into the room.

MISCELLANEOUS NEWS.

GAS TESTING IN LONDON.

London County Council and the Gaslight and Coke Company.

At the Meeting of the London County Council to-day (Tuesday), the following report of the Public Control Committee will be presented.

Among the Acts passed during the current session of Parliament, affecting the work of the Council, is the Gaslight and Coke Company's Act, 1909, which received the Royal Assent on Aug. 16. The Act provides, *inter alia*, for the transfer to that Company of the undertaking of the West Ham Gas Company, and makes certain alterations as regards the standard quality of the gas to be supplied by the Company.

As from the date of the passing of the Act, the standard illuminating power of the gas was reduced from 16 to 14 candles—thus placing the Company in a uniform position in this respect with the other two Metropolitan Gas Companies. Provision is made for a consequential reduction in the standard price, &c., of gas, and for the Company to supply, gratis, burners suitable for the lower illuminating power in place of those already in use.

The Council did not oppose the lowering of the standard of illuminating power, but successfully directed its efforts to securing a standard of calorific power. The standard fixed is 125 calories net per cubic foot of gas, with an allowance of 12½ calories (10 per cent.) on an average of each of three days, or of 18¾ calories on any one day. That is to say, the Company is now liable to forfeitures if the calorific power falls below 106¼ calories on any one day or below 112½ calories on an average of three days. The Board of Trade is authorized to vary the standard on the expiration of three years, on appeal by either the Company or the Council.

In order to take advantage of the provisions of the Act without adding to the work of the Gas Examiners, we have arranged for the testings for calorific power, which up to the passing of the Act were taken for information only, to be continued, but for only one testing for illuminating power with the flat-flame burner to be made weekly on Sundays at each testing-place, instead of three testings daily—the daily testings for sulphur impurities being continued; and that a test for calorific value on Sundays shall be substituted for the usual illuminating power testings by means of the argand burner.

In view of the diminishing importance of illuminating power testings, and the general unification of the standard, we have given authority for the number of testing-places at which such testings shall be made on Sundays in the districts of the two Companies not working to a calorific standard, to be varied from time to time. We think that, by the arrangements above indicated, the interests of the consumers will be adequately safeguarded.

DANISH GAS COMPANY.

At the Ordinary General Meeting of this Company to be held on Thursday, the Directors will report that the net revenue for the year ended the 30th of June is £66,228; and that as the amount brought forward from the last account is £37,659, the total standing to the credit of the profit and loss account is £103,887. Compared with the previous year, there was practically no increase in the revenue; while the quantity of gas sold was greater by 3·67 per cent. The Directors say these figures may yet be considered satisfactory, because the price of gas was less in the past year by nearly 2d. per 1000 cubic feet, and wages and wear and tear cost more. The smaller percentage of increase in sales is mainly due to the new law as to the closing of shops.

After charging the debenture interest and the loss on exchange, and setting aside £13,000 to the reserve and redemption account, there remains £80,257 available for distribution. An interim dividend of 2½ per cent. on the preference shares and 4 per cent. on the ordinary shares was paid on the 25th of March; and the Directors recommend that dividends should be declared of 2½ per cent. on the preference shares and 5 per cent. on the ordinary shares. Further, that a bonus of 1 per cent. be paid on the ordinary shares in respect of the year. These dividends will amount together to £43,500, and will leave a balance of £36,757 to be carried forward.

During the year, there was charged to capital account £69,470, of which £35,852 represents expenditure in connection with new buildings, apparatus, mains, meters, &c., at the several stations of the Company, and £33,618 the further expenditure in connection with the new works which are being erected at Flensburg. At amount of £77,244 is written out of the capital account for the Randers works, &c.; these works having been taken over by the town, as from the 1st of April last, on terms which, under the special circumstances of the case, the Directors state are satisfactory to the Company.

Accompanying the Directors' report is that of the Engineer (Mr. A. W. Edwards). He states that the total consumption of gas in the twelve months ending the 30th of June was 1,139,122,000 cubic feet; being an increase of 40,355,000 cubic feet, or 3·67 per cent., compared with the previous year. This increase is below the average, and Mr. Edwards says it may be accounted for partly by depression in trade and industry in Denmark, and partly by the new law referred to in the report of the Directors. Dealing with the different stations, Mr. Edwards reports that the building of the new works at Flensburg is making satisfactory progress. The new condensing plant at Odense has been completed and is working well. The new gasholder at Aalborg has been erected and brought into use; and the relaying of the trunk main through the town has been completed. The new retort-house and ovens at Viborg are working well. New gasholders are being built at Assens and Elsinore. The working at the Strandvei and Frederiksberg stations is satisfactory. The first year's working of the new Tikjob district has been satisfactory—the consumption being more than had been estimated. The Company are in negotiation with the Afminderod-Gronholt Council regarding the supply of gas and water to their district from the mains in the Tikjob district. As to residuals, tar has been depressed in price, but the demand for coke is good.

NEW GAS SUPPLY FOR HAILSHAM.

Inauguration Ceremony.

The new gas supply for Hailsham was started on Monday of last week by the turning of a valve which allowed the gas to flow from the Eastbourne Gas Company's mains into those of the Hailsham Company, whose undertaking, as will be remembered, was recently absorbed by its larger neighbour. The laying of the trunk main from the Eastbourne works to connect up Hailsham has been quite an extensive work, representing nearly 10,000 yards of 12-inch pipes. By the desire of the East Sussex County Council, the main has been laid at a uniform depth of 2 ft. 6 in. below the surface of the roadway; this depth being considered necessary owing to the vibration caused by heavy traffic. The work has been done entirely by administration, under the direction of Mr. John Hammond (the Resident Engineer), assisted by his son (Mr. W. H. Hammond). The ceremony attending the turning on of the gas took place in the presence of the Directors and officials of both the Eastbourne and Hailsham Companies, and a number of residents. A timber framework erected near the point where the two systems of mains join bore several modern gas-lamps, below which appeared the inscription "May Cheap Gas further Hailsham's Prosperity."

Mr. J. J. White (the Chairman of the Hailsham Gas Company) remarked that in 1853 a few people in Hailsham combined together in order to form a Company to light the streets, and generally to supply the town. They started by charging 8s. 4d. per 1000 cubic feet. But this was too dear for consumers; and in the following year it was reduced to 6s. 8d., at which figure it remained for 25 years. In 1880, it dropped to 5s. 10d.; and in 1895, it fell as low as 5s. But then came trouble in the coal world; and in 1900 they had to advance the price to 5s. 10d. In 1901, the Company managed to reduce the price to 5s. 5d.; and now, as a result of the amalgamation with the Eastbourne Company, the inhabitants of the town were to have their gas at the exceedingly low figure of 2s. 11d. As Chairman of the Hailsham Gas Company, he had been blamed for handing over the undertaking to the Eastbourne Company. Had the concern been retained in local hands, the consumers could never have hoped for the advantage they were about to enjoy; and the shareholders must always have been content with less than 10 per cent. for their money. They were to have cheap gas; and he hoped they would take full advantage of the concession by burning the gas freely both for illuminating and cooking purposes. He would now request Dr. Jeffery to turn on the gas from the new main.

Dr. G. A. Jeffery, J.P. (the Chairman of the Eastbourne Gas Company) said he had never before been called upon to perform so novel a function as this; but his position was a very pleasurable one, since he had the privilege of opening a supply of gas from Eastbourne to Hailsham—a gas so cheap that everyone might use it, and affording a light so brilliant, so soft, and so reliable as to make it a pleasure to read or work by it; while it was second to none for cooking and heating purposes. But beyond all this, he believed they were cementing a friendship which already existed between the two towns.

By turning a lever, Dr. Jeffery then admitted the gas into the Hailsham pipes from the Eastbourne Company's new trunk main; and the overhead lamps became automatically illuminated. The operation evoked hearty applause, which was renewed when Dr. Jeffery formally announced that the new supply had now definitely commenced.

A party of nearly forty subsequently sat down to lunch at the George Hotel, on the invitation of the Directors of the Eastbourne Gas Company—Dr. Jeffery presiding. A toast list was gone through, in the course of which testimony was borne to the friendly character of the negotiations that had taken place between the Companies, and to the liberal manner in which the Eastbourne Company had behaved.

Mr. White, in proposing "The Chairman," said the Eastbourne undertaking had had the advantage of a continually increasing population. This assistance had, no doubt, tended to further its welfare, so that it had at length been able to reduce the price of gas to 2s. 6d. per 1000 cubic feet. Another advantage it had enjoyod was that of having a wise and capable Chairman, not for any short time, but for a great number of years. They all knew that, if a thing was to be successful, there must be continuity of purpose over an extended period. The Eastbourne Company had had this advantage in the person of the gentleman who was presiding over them that day. The Hailsham Company had had four or five different Chairmen; but the Eastbourne Company were more fortunate. They of the Hailsham Company desired through him (Mr. White) to ask Dr. Jeffery's acceptance of a memento of the day's proceedings. The inscription on the silver salver which he asked the Chairman to accept was as follows:—

The Eastbourne Gas Company,

With which is Incorporated the Hailsham Gas Company.

Presented to Dr. G. A. Jeffery, J.P., C.A.,

Chairman of the Company,

To Commemorate the Turning-on of the Gas Supply from Eastbourne to Hailsham.

Oct. 18, 1909.

He thought when the family of Dr. Jeffery, in the years to come, looked on the gift and reflected what their father had done, they would be proud of the long and active life devoted in so many ways to the public service.

Dr. Jeffery, in responding, said he was taken quite by surprise at this especial mark of their kindness and goodwill. He thanked Mr. White particularly for his complimentary references. He valued the gift very highly, and he also greatly appreciated the cordiality with which his name had been received in connection with the toast. He should retain a grateful recollection of their kindness, and also pleasant memories of the day's proceedings.

Mr. J. S. Garrard (the Secretary of the Eastbourne Gas Company), proposed "The Chairman of the Hailsham Gas Company," and Mr. F. R. Holman also bore testimony to the excellent services rendered by Mr. White in bringing about the consummation which was being celebrated that day.

The toast was drunk with great heartiness.

GAS APPLIANCES AT THE BREWERS' EXHIBITION.

The collection of machinery, appliances, and produce which is annually on view at the Agricultural Hall, Islington, towards the close of October, under the title of the Brewers' Exhibition and Market, has of late years lost much of its old interest for readers of the "JOURNAL;" and the thirty-first of the series, which closed last Friday, contained little to raise it above the level of its immediate predecessors.

Gas-stove makers who formerly exhibited have retired, and left the Richmond Gas Stove and Meter Company, Limited, in possession of the field; and a brilliant show they always make. This year it comprised an excellent collection of gas cookers and fires, gas-steam radiators, stoves, hot closets, carving-tables, &c. There were also at their stand several of the "Syphon" bar stoves made by Messrs. S. Clark and Co., of Canonbury, who, as is well known, make a speciality of these stoves, which are largely in use in public-houses, hotels, restaurants, &c., as they combine hot-water heater, muller, coffee-urn, and heating-stove. The entire stand was brilliantly illuminated by Messrs. J. & W. B. Smith, of Farringdon Road, who employed for the purpose their "Silva" inverted incandescent gas-lamps, which are excellent for inside shop lighting. The firm claim for each burner used in these lamps (varying from one to three) a lighting capacity of 125 candles with a consumption of about 4 cubic feet of gas per hour. Not far from this stand was that of the Eagle Range and Gas-Stove Company, Limited, who showed in operation a number of improved coal ranges. In the gallery, the Chipperfield Lamp Syndicate, Limited, had on view two of their high-power self-intensifying gas-lamps, which were fully described in the "JOURNAL" for Sept. 29, 1908.

Among the other exhibits, two connected with water supply may be briefly noticed. At the stand of Messrs. T. & E. Wannbacher, the Ruud instantaneous automatic water heater was seen in operation. The apparatus consists of an insulated cast-iron jacket containing a long copper heating-coil under which is an improved bunsen burner. The automatic mechanism consists of a water-valve of simple construction and an "internal" thermostat. The latter, which regulates the temperature of the water by controlling the flow of gas to the burners, is constructed in accordance with Ruud's patent. The opening of any hot-water tap which may be connected to the heater causes the water-valve on the latter to open a gas-valve, and the gas is lighted from a pilot flame. The water heats as rapidly as it is drawn, and flows at a good temperature as long as the tap is open. When this is closed, the gas is instantly shut off. The apparatus can be attached to any existing water supply.

Messrs. W. M. Still and Sons, Limited, showed a specimen of Jones and Still's patent automatic water-boiler, to facilitate the preparation of hot drinks, tea, &c., automatic gas-steam boilers for cooking, and an automatic gas circulating boiler for lavatories, baths, and wash-ups. These appliances are economical in operation, as the consumption of gas is small while it is in use, and it is automatically cut off when the water boils. Another feature is that only boiling water can be drawn from them.

LIGHTING DEVICES AT THE DUNDEE EXHIBITION.

Towards the close of the account given in the "JOURNAL" for the 12th inst. of the exhibition of gas appliances which was opened in Dundee the preceding Wednesday, it was mentioned that one of the stands on which some elegant lighting devices were shown was that of Messrs. Hands and Co., of London and Glasgow. Some of these may be more particularly noticed.

The above-named firm had on view on their stand a good range of hand-beaten art metal gas-fittings, finished in oxidized copper, which were very much admired by visitors; and we understand that considerable business in this class of goods was done at the exhibition. They also showed their latest form of vertical inverted burner, their special claim for which is that it has a perfectly cool head, and carries an absolute guarantee not to discolour any fitting upon which it is used. Some of these burners, which were described and illustrated in the "JOURNAL" a few months ago, were in use upon the fittings displayed; and it was pointed out by the firm's representatives that there was not the slightest discoloration upon them. The "Dreadnought" lamp, to which attention has already been called in our columns, is another patent of this firm which has been specially designed to meet gas companies' requirements. Every part is standarized, interchangeable, and readily accessible. It is a particularly compact lamp—the diameter of the body, which is of copper, being only 6½ inches; and it is made for various numbers of burners, ranging from one to five. It is British made throughout, and has a lighting efficiency of 125 candles per burner for a consumption of rather less than 4 cubic feet of gas per hour.

The "Norwich" system of gas lighting—another of the specialities of the firm—was also in use. It is claimed that there is nothing in the system to cause any trouble; and considering that all parts of the switch and valve are made of metal, an installation once put in should last for many years without requiring renewals or repairs. Another advantage is that no air-tubes or electric wires are required to be twisted round the fittings to be controlled. Messrs. Hands also showed a patent safety cock which it is impossible to turn on accidentally. These cocks should be of great service to members of the gas profession, both for gas ovens and fires, as they absolutely ensure consumers against accidents.

In the previous notice of the exhibition, reference was made to the lighting of the stand of Messrs. R. & A. Main, Limited, by Messrs. George Hands and Co. We may add that it was particularly artistic, as was also the lighting of the tea-room there. Both were greatly admired by Mr. Yuill, the Gas Engineer to the Dundee Corporation, as well as by a large number of members of the gas profession who visited the exhibition.

Belfast Gas Exhibition.—In the notice of the opening of this exhibition which appeared in the "JOURNAL" last week, the amount stated by the Chairman of the Gas Committee (Mr. J. A. Doran) as having been applied in reduction of the rates at the end of the past financial year should have been £24,000, not £2400 as given.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 234.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 14	10	Alliance & Dublin 10 p.c.	17½—18*	−¼	5 11 1
298,955	10	,,	7	Do. 7 p.c.	12⅝—13*	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	May 27	6¼	Bombay, Ltd.	5⅞—6⅛	..	5 6 1
40,000	5	,,	6¼	Do. New, £4 paid	4⅝—4⅞	..	5 6 8
50,000	10	Aug. 26	15	Bourne-mouth Gas and Water	10 p.c.	..	5 5 3
311,810	10	,,	7		B 7 p.c.	..	4 3 7
75,000	10	,,	6		Pref. 6 p.c.	..	3 16 2
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	254—257	+1	4 17 3
300,000	,,	,,	9⅜	Do. New	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208—213	..	5 3 3
246,320	,,	,,	8	Do. A Ord. Stk.	150—152	..	5 5 3
460,000	20	Oct. 14	10	British	42—43*	..	4 13 0
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118—120	..	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88—90	..	5 0 0
82,278	,,	,,	5⅛	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	June 25	3½	Do. 3½ p.c. Deb.	88—90	..	3 17 9
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	13¼—14*	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
100,000	10	—	—	Cape Town & Dis., Ltd.	4¼—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅛—5⅜	−¼	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	5 5/16	Commercial 4 p.c. Stk.	109—111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	104—106	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800 000	Stk.	,,	5	Continental Union, Ltd.	97—99	+1	5 1 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Oct. 2	5	East Hull 5 p.c. Ord.	97—99	..	5 1 0
486,090	10	July 14	12	European, Ltd.	24⅜—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅜	Gas light and Coke	4 p.c. Ord.	..	105—106	−1	4 8 0
2,600,000	,,	,,	3½		3½ p.c. max.	..	88—90	..	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	104—105	+½	3 16 2
4,193,975	,,	June 11	3		3 p.c. Con. Deb.	..	85—87	..	3 8 11
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.		..	92—94	..	5 6 4
82,500	,,	,,	6½	Do. do. 5 p.c.		..	117—119	..	5 9 3
70,000	10	Sep. 29	11	Hongkong & China, Ltd.		..	17½—17⅝	..	6 4 0
131,070	Stk.	Sep. 10	6½	Ilford A and C		..	138—140	..	4 12 10
65,780	,,	,,	5	Do. B		..	105—107	..	4 13 6
65,500	,,	June 25	4	Do. 4 p.c. Deb.		..	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental		..	180—182	..	4 7 11
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.		..	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119—121	..	4 19 2
561,000	Stk.	,,	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. B	166—168	..	4 3 4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅝—5⅛	..	5 17 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	99—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd.	12⅝—13¼	..	5 5 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con	106—108	..	4 3 4
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	93—94	..	3 14 6
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13⅛	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd.	6⅞—7⅛	..	6 5 6
31,800	53	Aug. 26	13	Portsea Island A.	137—139	..	4 19 0
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	120—123	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord.	7—7¼	..	4 16 7
796,980	5	July 29	5	Do. 5 p.c Pref.	5¼—5⅜	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	95—97	+1*	4 2 6
1,000,000	10	Oct. 14	8	River Plate Ord.	16¾—16¾*	..	4 15 7
312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Sep. 29	8	San Paulo, Ltd.	14⅞—14⅞	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref.	11¾—12⅛	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	51—52	..	4 16 2
135,000	Stk.	Sep. 10	10	Sheffield A	230—232	..	4 6 2
269,984	,,	,,	10	Do. B	229—231	..	4 6 7
523,500	,,	,,	10	Do. C	229—231	..	4 6 7
70,000	10	Oct. 14	10	South African	12½—12⅝*	..	7 16 11
6,429,895	Stk.	Aug. 12	5⅛	South Met., 4 p.c. Ord.	120—122	..	4 7 4
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	85—87	..	3 8 11
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Aug. 12	5⅛	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 10 11
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord.	111—113	..	4 8 6
120,000	Stk.	Aug. 12	6⅝	Tottenham A 5 p.c. and B 3½ p.c.	133—135	..	5 1 9
453,940	,,	,,	5⅛			..	111—113	..	4 15 3
149,470	,,	June 25	4	Edmonton 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9⅛	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,656	Stk.	Aug. 26	6⅝	Wands-worth B 3½ p.c.	139—141	..	4 14 0
79,416	,,	June 25	3	3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅛	West Ham 5 p.c. Ord.	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref.	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk.	112—114	..	3 10 2

Prices marked * are "Ex div."

IMPROVEMENTS AT SEAHAM HARBOUR GAS-WORKS.

The town of Seaham Harbour, which for many years was stagnant, has within the past few years undergone a rapid change, and the building trade has been very busy—whole streets of houses being rushed-up. To cope with the increasing demand for gas, the Gas Company last year put down four new luteless purifiers, 20 feet square, to replace four old ones 10 feet square, and also a station meter and a new exhauster, both for 20,000 cubic feet per hour. This year the Directors contracted with Messrs. Ashmore, Benson, Pease, and Co. to take out a single-lift gasholder, 80 ft. by 22 ft., with columns and girders, and replace it by a three-lift spiral-guided one. The holder was handed over to the firm in May, and was to be finished in September. The contract has been carried out, and the holder handed over to the Company exactly to time, and to the entire satisfaction of their Manager (Mr. J. Whyte), under whose supervision the work was done. This is the first spiral holder erected by the firm, and it reflects the greatest credit on all concerned with it. The three lifts are 75 ft., 77 ft. 6 in., 80 ft., and 22 ft. deep; and the holder will prove a great addition to the storage.

COST OF PRIVATE BILL LEGISLATION.

In accordance with notice of motion, Mr. Barrett moved, at the last meeeting of the Heywood Town Council—"That the attention of the Government be directed to the present extravagant system under which the permission of Parliament is obtained before municipal authorities can proceed with local schemes by way of Parliamentary Bills; and this Council is of opinion that the machinery should be simplified so as to give satisfactory results at a considerably reduced expenditure; and that copies of the resolution be sent to the Right Hon. H. H. Asquith, M.P., Prime Minister, the Right Hon. John Burns, M.P., President of the Local Government Board, Sir Edward H. Holden, M.P., and the President and the Executive Committee of the Association of Municipal Corporations."

In support of his resolution, Mr. Barrett said it was a plea for increased local control over ratepayers' money. He quoted the cost of Parliamentary Bills which had been promoted by Heywood and neighbouring boroughs. A Bill promoted by Burnley in 1909 cost £6188; and by Oldham, in 1906, £5000. Bolton, in 1905, promoted a Bill which cost £9148; and the Rochdale Water Act, 1898, cost £9400; Bury, in 1901, promoted a Bill which cost £2297. There were several other Bills promoted by Bury, the most costly of which was one in 1885, which cost £6750. If they took their own experience, Heywood, in 1883, promoted a Parliamentary Bill which cost £3865. Since that time, the Heywood and Middleton Water Board had had various Acts passed at a total cost of £5456; and then Heywood had their Tramways Provisional Order in 1908, which brought up the total for Heywood, along with the Heywood and Middleton Water Board, since the incorporation of the borough, to £10,052. When they added to this the cost of the Bill which had recently been promoted, they would get to a very magnificent sum. He thought it was an open secret that their Bill would cost no less than £5000. The time allowed for payment was five years; and to meet interest and sinking fund, they would need to have a rate of 2¼d. in the pound for five years imposed on the ratepayers. He believed there was not a man on the Council who did not reluctantly vote in favour of the Bill; and it was only when they realized that they could not obtain the powers they required by any other means that they agreed to support it.

The resolution was carried with the addition of the name of the Hon. A. J. Balfour, M.P., to those to whom a copy should be forwarded.

NOTES FROM SCOTLAND.

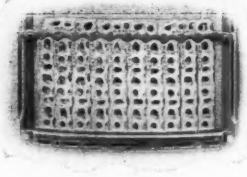
From Our Own Correspondent.

Saturday.

The Western District Junior Gas Association held their opening meeting in Glasgow to-night, under conditions which, when the result is looked at, ought to make everyone connected with the Association feel proud. The evening was marked by a rainstorm which would have been sufficient excuse for anyone staying at home; yet the attendance has not been exceeded in number since the early days of the Association's existence. This instance of revived interest in the organization is very welcome. It is to be hoped that the members will keep it up. It has all along been a feature of the Western District that the honorary members have given very generous aid in the work. They, as well as the ordinary members, were present in great force to-night, and took a large share in the proceedings. These consisted of an address by the new President—Mr. D. Currie, of Stirling—on the valuation and selection of gas coals. The address was a most thoughtful one, as the remarks in the discussion upon it show. The Western District are to be congratulated upon the vigour with which they have started the session. A good syllabus of events for the season has been drawn up; and expectation as to the winter's work is high.

The Falkirk Town Council on Monday discussed the subject of supplying free cookers. It came up in a recommendation by the Gas Committee, by a majority of two, that cookers be given out free, and that a Committee be appointed to arrange the whole matter. Mr. Sinclair, in the Council, said the question involved a principle which he could not admit at all. Every man who used gas could not use a cooker. They had £5000 of capital invested in cookers; and they had spent during the past year something like £700 in purchasing new ones. Taking the life of a cooker at ten years, this meant that they had to lay aside £500 a year to replace those in use; and, in addition, there were large interest and maintenance charges. This cost had to come from

OUR Patent "THERMO" Firefront



The Pioneer of Perfect Radiation.

OUR Patent "N.V."

The Pioneer of the Adjustable Gas-Fire Idea,

AND OF

OUR Wide-Fire Principle

The First Wide Fire that has ever been a working success.

OUR INTERCHANGEABILITY SYSTEM

by which for many years past all the wearing parts of equal-size stoves have been mutually

INTERCHANGEABLE!

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

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the revenue; and he did not think the gas undertaking was yet in a position to stand it. He moved that the subject be sent back to the Committee for further consideration. Mr. Graham was surprised to hear the arguments which had been used. The term might be "free" cookers; but the cookers were not free when the price for the gas they used was the same as for lighting. A year or two ago there was a preferential rate on cookers, which perhaps meant as much to the user as the rent of the cooker. He thought they were only giving a little preference to the users of cookers; and he mentioned that, with the view of increasing the output of gas, in Dundee, Arbroath, Paisley, and other towns, they had tried the experiment with great success. They wanted everybody to use cookers. Treasurer Wallace considered that they could not afford to give free cookers. They found that differential rates were a mistake. Their undertaking could not stand them. It was far better to see the people getting their value in gas, and the town getting a return for the capital invested in stoves. Bailie Russell, in support of the recommendation, said that many stoves were being returned by the users, because the people would not pay the same price for gas for cooking as they did for lighting. The Council gave a differential rate for gas used in engines; and why should they make it more expensive for people to get their food cooked? The greater the number of cookers out, the greater would be the demand for gas. Mr. Russell thought they should make an effort to supply gas as cheaply as in other towns before they tried this experiment. The cooker had been compared with the gas-engine; but there was no comparison whatever. With the gas-engine there was a steady consumption the whole day, whereas the cooker might only be used for an hour. Bailie Bogle, the Convener of the Gas Committee, said that the experience of all towns in which free cookers had been introduced was the reverse of what some of them imagined. In Manchester, since they were introduced the proportion of users had gone up from 1 in 11 to 1 in 4; and other places spoke in unqualified approval of the system. They must not think that users of free cookers could do what they liked with them. They had to sign a guarantee that they would use a certain quantity of gas per annum. He had not the slightest doubt that the system, if adopted, would pay handsomely. There was a movement in Glasgow just now to adopt the system. By a majority of one, the Council resolved to supply cookers free.

On Thursday, the Town Council of Falkirk met specially to consider the report of a Special Committee who had been appointed to investigate allegations which had been made against, and reflected upon, Councillor H. Russell. The Special Committee reported that they had had before them ex-Bailie Hamilton and Mr. Arthur Happer, and had interrogated them on the subject. They submitted findings to the effect: (1) That from March 15 to Oct. 10, 1895, Mr. Russell made numerous complaints regarding a defective supply of gas for his engine; that there was cause for complaint at the time, as the gas-works had only lately been taken over by the Council, and numerous connections were being made; that the meter appeared to have been sent to the makers for testing purposes; that, the meter makers having destroyed the meter, the Council had to compromise with Mr. Russell by paying him twelve guineas, and that they claimed relief from the meter makers, who paid half. (2) That in December, 1896, and in February and March, 1897, Mr. Russell complained as to want of pressure; that between the 23rd and 25th of March, 1897, it was ascertained that an unauthorized connection to the Gas Commissioners' pipe had been in use by Mr. Russell; that after a meeting with the Town Clerk, Mr. Russell lodged £5 with the Town Clerk on the 26th of March; that on the 16th of April the Gas-Works Committee passed the following minute: "A report by the Manager was read, along with certificate by the Government Inspector, as to Mr. Henry Russell's meter, and, after deliberation, it was agreed not to prosecute Mr. Russell on the present occasion, seeing that he had lodged £5, which has been forfeited, on the understanding that any similar case will be prosecuted in future." (3) That from the Manager's report of April 16, 1897, it appeared that Mr. Russell's meter was tested on March 29 by the Chief Inspector of Meters, who reported that the meter was tested at 11-10ths, which was a little less than was found at the inlet of his meter when working at its full capacity—that is to say, 120 cubic feet per hour; the pressure on the outlet of the meter was found to be 10-10ths; the certificate shows that the meter was indicating 6 per cent. fast, on which account a rebate of £10 was afterwards allowed to Mr. Russell by the Gas Commissioners, in August, 1897. In the course of a discussion upon this report, it was stated that a technical error was made by Mr. Russell, but that the Special Committee were satisfied there was no fraudulent intent. The report was adopted.

A discussion upon the quality of the gas supplied in Dundee took place in the Gas Committee on Tuesday, having been initiated by Mr. Watson, who said that two persons had complained to him about the gas, and that he had himself noticed that it was very indifferent. Mr. J. Reid, the Convener, replied that it would be very unfair to the 90 per cent. who used the incandescent light to give a better gas at an additional cost. The gas that was made to-day was not suitable for the flat-flame burner. Mr. A. Yuill, the Manager, stated that ever since he had had to do with the manufacture of gas, this season of the year was always prolific of complaints. When they had 30-candle power gas, they had more complaints than during the past five years. On investigating complaints, he had found the cause was due to defective interior fittings. It would be in the interest of every consumer to adopt incandescent lighting. It was impossible to manufacture gas which would be suitable both for incandescent lighting and for the flat-flame burner. Mr. Yuill's explanation was considered satisfactory.

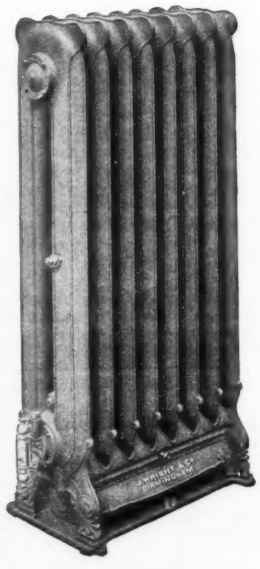
The gas exhibition in Dundee, which was closed on Wednesday evening, after having been open for a fortnight, was a great success from a commercial point of view. The attendances at the cookery lectures of Miss Dods were very large, particularly in the evenings, and led to a much more general appreciation, on the part of the public, of the possibilities and advantages of cooking by gas, with the consequence that orders flowed in freely for the hire of cookers.

The Directors and officials of the Cupar Gas Company, Limited, held their annual supper on Thursday evening. Hon. Sheriff-Substitute

The Pioneer Radiator

For every situation where a flueless stove may be used.

OUR "ST. ANDREW."



THE CHOICE!

OUR "St. Andrew"

and

Our "Official"

meet all requirements, no matter how varying the conditions. The "ST. ANDREW" will do most of it—the "OFFICIAL" will do the rest—and do it well, with the minimum cost for maintenance.

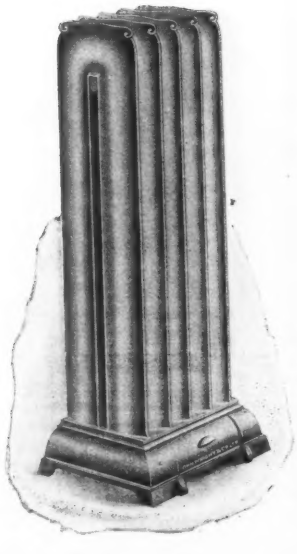
The Radiators—*Have Metal-to-Metal Joints,*
Have no Internal Tubes,
Never need taking apart.

JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM.

FLUE Radiator

The Pioneer Radiator for every other situation.

OUR "OFFICIAL."



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Honeyman presided, and gave an interesting account, obtained from old records of the Company, of the progress of the works since they were started in 1831; the Chairman's remarks being supplemented by Mr. J. Macpherson, the Manager.

The Watching and Lighting Committee of the Edinburgh Town Council on Monday considered the offer of the Gas Commissioners to light the common stairs in the city by incandescent gas-burners, at the cost of 17s. 6d. per lamp per annum; the Gas Commissioners to instal the lamps and to undertake their upkeep and the extinguishing of them. The contract is to last for three years. On the motion of Mr. Wilson, it was agreed to recommend the Town Council to accept the offer.

About 11.15 on the evening of Saturday last, the whole of the electric lights in the central and northern parts of Aberdeen suddenly went out—both the public and the private lighting. In the course of ten minutes the light was restored. The cause of the mishap was that a dynamo which had just been switched on failed to take its load.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 23.

Sulphate of Ammonia.

This week's demand has continued fairly good; but, supplies always being ample to meet every requirement, prices have barely been maintained, and the nearest values to-day are £11 3s. 9d. per ton f.o.b. Hull, £11 5s. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. For forward delivery, the position is unaltered. Makers continue to ask a premium of 2s. 6d. to 5s. per ton, according to time of shipment, which buyers refuse to pay; but a few second-hand transactions are reported for November-December at prompt prices, and at very little more money for January-June, 1910.

Nitrate of Soda.

The market remains without change at 9s. 3d. and 9s. 6d. per cwt. on spot, for ordinary and refined qualities respectively.

LONDON, *Oct.* 25.

Tar Products.

The markets for tar products have been quiet throughout the past week, but there is no actual alteration in price. In pitch, the market appears to be rather easier, and orders have been taken on the Continent at lower prices than has been the case for some time. Business has been done on the east coast at 26s. for delivery to the end of the year; and it is doubtful whether anything over this price can be obtained to-day for delivery to the end of June. London manufacturers are well sold; but it is doubtful whether the value of pitch in London is anything over 26s. to 26s. 6d., while it is worth about the same price on the west coast. Creosote is quiet, and some quantity is reported to have been sold in London at 2½d. per gallon; but this was probably one of the outside makes, as the principal London makers do not report having sold any quantity. In the Midlands, makers are firm in their ideas, as they are fairly well sold. In the North, oil is quiet, and business is reported to have been done at 2d. Benzol, 90 per cent., is still very firm in London; but in the North prices are unchanged. Both in London and the North, 50-90 per cent. benzol is firm. Toluol is very good indeed, as is also solvent naphtha, of which article the London manufacturers in particular appear to be decidedly short. Heavy naphtha is quiet, and there is but little demand for it. Carbolic acid is unchanged, and the Continental manufacturers are offering low prices; but the figures put forward by the English makers show a slight improvement. Naphthalene is neglected; but salts are in good demand.

The average values during the week were: **Tar**, 13s. to 17s., *ex* works. Pitch, London, 26s. 6d. to 26s. 9d.; east coast, 26s. to 26s. 3d.; west coast, 25s. to 26s. f.a.s. Mersey ports, 26s. 6d. f.o.b. others. **Benzol**, 90 per cent., casks included, London, 6⅝d. to 6¾d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7½d.; North, 6⅝d. to 7d. **Toluol**, casks included, London, 9d. to 9¼d.; North, 9d. **Crude naphtha**, in bulk, London, 3⅜d. to 3⅝d.; North, 3⅜d. to 3⅝d.; **solvent naphtha**, casks included, London, 1s. to 1s. c¼d.; North, 11¼d. to 11⅜d.; **heavy naphtha**, casks included, London, 10½d. to 11½d.; North, 10d. to 10⅛d. **Creosote**, in bulk, London, 2⅛d. to 2⅝d.; North, 2d. to 2¼d. **Heavy oils**, in bulk, 2¾d. **Carbolic acid**, 60 per cent., casks included, east coast, 10¼d.; west coast, 10½d. **Refined naphthalene**, £4 10s. to £8 10s.; **salts**, 40s., packages included and f.o.b. **Anthracene**, "A" quality, 1⅛d. to 1⅜d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been quiet the past week, and closes with a downward tendency. The Gas Companies quote £11 7s. 6d. for prompt, and £11 12s. 6d. for January-June. Outside makes can be secured upon Beckton terms at £11 to £11 2s. 6d. In Hull, business is reported at £11 2s. 6d., and in Liverpool at £11 3s. 9d. In Leith, manufacturers are asking £11 7s. 6d. for prompt, and £11 12s. 6d. for January-June, but cannot obtain these figures.

Effect of Inadequate Water-Pipes.—At the annual meeting of the North Warwickshire Water Company last Thursday, reference was made in the Directors' report to complaints received from consumers in the Company's new district of Knowle of the furring-up of the hot-water pipes owing to the hardness of the water. As no complaints came from any of the Company's other districts, the matter was investigated, and it was found that all the trouble arose from the pipes being too small. They had been provided for a supply of softer water than the Company's. The offending pipes at a consumer's house were taken out and replaced with larger ones, and a larger boiler was fitted; and examination after a three months' trial showed that there was no incrustation.

Richmond's "EGYPTIAN" Gas Fire.

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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has shown some fluctuation of late; but on the whole the prices seem a little easier than they were a week or so ago. In the steam coal trade, best Northumbrians are slightly lower for early delivery—from 10s. 7d. to 10s. 9d. per ton f.o.b. being quoted. For second-class steams, from 9s. to 9s. 6d. is the price; and for steam smalls from 5s. to 6s. More coal is being sold forward over next year at higher prices than those current. In the gas coal trade, the home demand is naturally increasing with the lengthening nights; and the deliveries on the long contracts are now very heavy. Durham gas coals vary from about 10s. 3d. to 11s. per ton f.o.b. for the usual classes, according to quality; while for "Wear" specials, up to 11s. 9d. is quoted. Inquiries continue to be made for coal for next year's delivery; but some of the gas coal collieries, being well sold forward, do not care to quote, except at rates like those that are current—the doubtful effect of the Eight Hours Act having its influence on prices. Coke is firm; and gas coke is from 13s. to 13s. 6d. per ton f.o.b.—the increased output being well taken up generally.

Scotch Coal Trade.

Trade continues to be quiet. The current demand for shipment is slack; but contracts for delivery over next year, at substantial advances over present prices, are still being made. The prices now quoted are: Ell 9s. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 326,484 tons—a decrease of 8871 tons upon the preceding week, and 10,314 tons upon the corresponding week of last year. For the year to date, the total shipments have been 12,144,250 tons—an increase of 571,795 tons upon the corresponding period.

Bideford Tradesmen and the Gas Company.—A letter from the Secretary of the Bideford Tradesmen's Association was read at the last meeting of the Town Council of the borough, with reference to the allegation that a large sum of money had been collected for gas over and above the legitimate charge. At the meeting of the Council in July, Mr. Squire, the Chairman of the Lighting Committee, stated that the amount overpaid was £7000, and cited in proof of it what had transpired before the Parliamentary Committee on the Gas Company's Provisional Order. The Secretary of the Tradesmen's Association now asked what action the Council were taking to get the money refunded. Mr. Squire said the subject was still under the consideration of the Committee. Until they heard from the Board of Trade, they could not say what the answer would be. A letter was read from the Secretary of the Gas Company (Mr. W. D. Joce) announcing that the Company would reduce the charge for lamps consuming 5 cubic feet of gas per hour from £2 18s. to £2 16s. 6d. per annum.

Sales of Shares.—Last Wednesday, Messrs. King and King offered for sale 2000 shares of £5 each, entitled to a dividend at the rate of 5 per cent. per annum, in the Portsmouth Water Company, at prices ranging from £6 5s. to £6 7s. 6d. each. The total amount realized was about £3000. At the Duke of York Hotel, Camberley, recently, Messrs. Sadler and Baker offered for sale 800 additional ordinary £10 shares in the Yorktown and Blackwater Gas Company; and they fetched from £14 10s. to £14 15s. each. The total amount realized was £11,722 10s., or an average of £14 13s. per share.

Carnarvon Water Supply.—The Special Sanitary Committee reported, at a meeting of the Carnarvon Town Council last Tuesday, upon the results of an investigation made by Mr. J. Parry, of Liverpool, into the water supply of the town, which a few months ago was in a very unsatisfactory condition, and caused the Council a considerable amount of trouble. After fixing meters, it was demonstrated that the shortage was caused by abnormal waste which was taking place owing to leakages in the town mains and to defective water fittings and pipes; and when these defects were in some degree remedied, the storage of water at the reservoir recommenced. Subsequently, the mains above the reservoir towards Nant Mill were cleansed for a length of 1540 yards. The Nant Mill main is now capable of delivering about 762,000 gallons a day; and the supply to the town has been reduced to something like 450,000 gallons a day. The improvement in both respects which has taken place will ensure an ample supply to the town for all purposes. The Committee remarked that the Council were greatly indebted to Mr. Parry for his valuable services, and also to the Borough Surveyor and Sanitary Inspector for the attention they had paid in carrying out the improvements suggested.

Whitchurch Council and the Gas Company.—At a special meeting of the Whitchurch Urban District Council, held to consider a communication from the Gas Company declining to negotiate for the sale of their undertaking on the basis of a scheme submitted to them, or to make any alternative proposals, Mr. Elson stated that there had been a redistribution of the Company's shares, and for each £10 share the holder received five £5 shares, the dividends on which had during the last year or two been 9 per cent., or within 1 per cent. of the maximum allowed. A year ago last April, the then Chairman of the Council remarked upon the fact that the Council, though the largest customers of the Company, were charged at precisely the same rate per 1000 cubic feet as the smallest customer; and he expressed his opinion that a reduction should be made. A reply was received to the effect that the high price of materials precluded a reduction. He (Mr. Elson) suggested that there were two courses open to the Council. One was to ascertain whether the Gas Company's Order could be repealed; and the other was to see whether an installation of electricity might not be brought about. He believed there would be companies willing to instal the light for public and private purposes at a cost to the consumer some 20 per cent. lower than the present price paid for gas; the Council to have the option of purchasing the concern in five or six years. It was resolved that the Lighting Committee should consider the latter proposal, and report to the Council.

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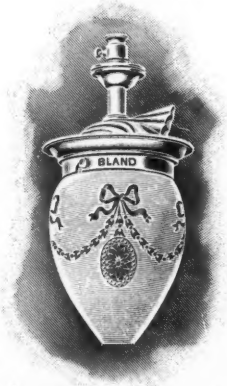
JAMES SHARPE, Secretary.



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Hipperholme Gas Question.—The dispute between the Hipperholme Urban District Council and the Halifax Corporation is, for the time being at any rate, settled. Hipperholme, as an out-district of the Corporation of Halifax, is charged a higher price for gas than are consumers within the borough; and the right of the Corporation to do this was disputed by the Council. A cheque for what was considered a fair amount was tendered in the first place, and refused by Halifax; but, after legal proceedings were threatened by the Corporation, Hipperholme adopted a different attitude, and paid the full sum claimed.

Projected Gas Supply for South Wales Villages.—At a recent meeting of the St. Mellon's District Council, a letter was read from Mr. S. J. Ackland, asking if the Council would undertake not to oppose an application for a Provisional Order for the supply of gas to Machen and Bedwas if he made one; and also whether the Council would consent to take gas for these places. It was decided that they could not commit themselves. The places named are two villages, about two miles apart, between Caerphilly and Newport. Bedwas is in the area of the Rhymney and Aber Valleys Gas Company. It is not yet supplied with gas by that Company, but it is with water. Machen is outside their area.

Ceara Gas Company, Limited.—In the report which the Directors of this Company will present at the annual general meeting on Friday, they state that the result of the year's working is a net profit of £7493. This, added to the balance brought forward, gives a total of £12,153. Deducting the interim dividend paid in April (£1688), there remains £10,465 available for distribution. Out of this sum, the Directors have transferred £4000 to the reserve fund, making that account £16,000, and recommend the payment of a dividend for the six months ended the 30th of June of 5 per cent. on the preference shares (less income-tax) and of 5 per cent. on the ordinary shares (tax free); making together £2284. These payments, with the interim dividend paid, will make 10 per cent. on the preference shares and 8 per cent. on the ordinary shares for the year. The balance carried forward will be £4180.

Lighting of Ainsworth.—The inhabitants of Ainsworth having manifested a natural and laudable desire to have certain of the roads lighted, a public meeting has been held to consider the matter. In opening the proceedings, the Chairman (Mr. Henry Whitehead) said the Parish Council had not been idle in the matter; and they had been making inquiries from the Radcliffe Gas Company and the Lancashire Electric Power Company. They were in a peculiar position at Ainsworth. The gas supplied to the houses and shops of the village came from Bury; but the Bury people had no power to light the streets. The powers to light the roads were held by the Radcliffe Gas Company, who, however, had no mains up there. The terms on which the Electric Power Company were prepared to light two or three miles of road, on a ten years' contract, would mean an addition of about 7d. in the pound to the rates. In the course of the discussion, regret was expressed at the seeming impossibility of arranging for a gas supply for the public lamps; but as to the wisdom of going in for a lighting scheme of one form or another, all the speakers agreed.

Geltsdale Water Scheme.—At the last meeting of the Finance Committee of the Carlisle Town Council, the City Treasurer reported that the total cost of the Geltsdale water scheme was £287,642; being £34,110 in excess of the amount authorized to be borrowed. The Committee instructed the Town Clerk to make application to the Local Government Board for a Provisional Order authorizing the borrowing of the sum of £35,000 to cover the excess expenditure, together with an additional £5000 if required.

New Water Board for Stourbridge and District.—The first meeting of the newly-constituted Water Board for Stourbridge and the district was held at the Town Hall, Stourbridge, last Tuesday. The Board, which will acquire the undertaking of the Stourbridge Water Company, Limited, on the 1st of January next, is composed of representatives of the Stourbridge, Lye and Wollescote, and Amblecote Urban District Councils, and the Kingswinford Rural District Council. The Bromsgrove Rural District Council was formerly associated with the scheme, but retired from it by common consent of the promoters.

Crewkerne in Darkness.—A dispute between the Crewkerne District Council and the Gas Company, as to the sum to be paid for public lighting, has had the effect of leaving the town in darkness for over a month past. The difference between the two bodies is only about £25; but though the amount is small, it has caused a great deal of correspondence, which so far has led to no definite result. The Gas Company offered to do the lighting for £280; while the Council, who considered this amount excessive, offered £255. After a number of letters had passed, a deputation from the Council met representatives of the Gas Company; but it does not appear that the meeting had the effect of producing agreement. It is now said that the Council have offered a slightly larger sum than at first; but the result of this is not known. In the meantime, Crewkerne streets are in darkness, and the inhabitants suffer a good deal of inconvenience.

Greenwich Public Lighting.—At the last meeting of the Greenwich Borough Council, the Highways Committee reported that they had considered a communication from the South Metropolitan Gas Company, stating that, as a result of their experiments with a new inverted burner for street lighting, they were able to make a substantial reduction in the yearly charge, in consequence of the reduced cost of upkeep and the lower price of gas. The new inverted burner referred to gives a light of 120 candles, compared with 80 candles for the No. 4 upright burner. The present charge for lamps fitted with the latter burner is £3 2s. 10d.; and the Company offered to replace them with the inverted burner, and make the necessary alterations to the lantern, at a charge of 3s. per lamp, and also to reduce the annual charge to £2 19s. 6d. In view of the fact that increased light would thus be obtained at less cost, the Committee expressed the opinion that the offer of the Company, so far as the lamps fitted with No. 4 burners are concerned, be accepted; and they recommended that the Borough Engineer should make the necessary arrangements for having the whole of the No. 4 burner lamps in the borough refitted with inverted burners. This was agreed to.

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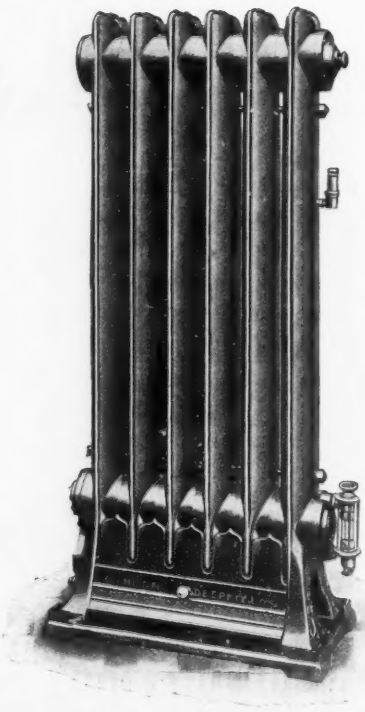

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Suicide by Gas.—Henry Beard, a West Bridgford tinsmith, was found a few days ago suffocated in his workshop. He was lying with an overcoat over his head; and a piece of piping was stretched from the gas-bracket, passed through the button-hole of his coat, tied there, and then the end placed close to his mouth. The Coroner's Jury returned a verdict of "Suicide while temporarily insane."

Limited Companies and the Franchise.—At the autumn general meeting of the Association of Municipal Corporations held in London last Friday, Mr. Abbott (Manchester) moved the following resolution: "That, in the opinion of this meeting, it is desirable that corporations and companies in occupation as owners or tenants of premises of a yearly value of not less than £10 shall be entitled to have one of their officers entered in the local government register of electors for the place in which the premises are situate, and such authorized officer may vote at any election (except a parliamentary election), and shall be qualified to be elected at such election as the owner or occupier of such premises; and that it be referred to the Council to take measures for giving effect to this resolution." Mr. Abbott, in support of his motion, said the City of London was one of the most amazing examples of the need for the proposed reform. It had a rateable value of £5,360,197, of which limited companies represented £3,428,089, or 63 per cent. The total amount raised by rates two years ago was £1,020,234, of which limited companies not represented on the register paid £1,164,122. These figures in themselves were, he said, sufficient justification for him to submit his resolution. The motion was carried.

Progress of the St. Mary Church Gas Undertaking.—Though the gas supply of the greater part of Torquay is in the hands of the Torquay Gas Company, the Corporation have control of that in the district of St. Mary Church. This part of the borough was formerly governed by a District Council; and the Corporation, in taking over their duties, acquired the gas-works as one of the Council's assets. Mr. Foster, the present Chairman of the Gas Committee, a few days ago at a ratepayers' meeting made a speech, in which he reviewed the progress of the undertaking since it came into the possession of the Corporation. During the last nine years, he said, the works had been completely remodelled, at a cost of many thousand pounds. The leakage had been reduced from 35 to 11 per cent., and the storage had been increased from 80,000 to 330,000 cubic feet—twice the maximum daily demand. The original outlay upon the works was £16,000, the whole of which sum would have been repaid by the end of the present year. Notwithstanding the large outlay during the nine years, they had accumulated a reserve fund of £2582. It was proposed, out of this sum, to pay for the installation of a patent gas producing apparatus, by which they expected to save 1000 tons of coal per annum. The price of gas had recently been reduced by 3d. per 1000 cubic feet; and it was believed that a further reduction would be effected next year. Though about £20,000 had been spent on the works during the past nine years, the whole of the capital would not exceed £19,000 at the end of the year. Were the works sold to a company, they would realize more than thrice this money.

Daylight Saving Bill.—Notwithstanding the fact that the Select Committee of the House of Commons reported against its adoption, it appears that the Daylight Saving Bill is not to be allowed to drop. Mr. Willett, the author of the proposal, is satisfied that with the great amount of support which has been promised by members of the House, he will have no difficulty in getting a similar Bill introduced next year. He has received intimation of the approval of the Bill from 120 Corporations and Town Councils (representing 15 million people), 35 Chambers of Commerce, 36 Trade Unions (representing 250,000 members), and, in addition, numerous business and other associations.

APPLICATIONS FOR LETTERS PATENT.

23,129.—Wood, R. S., "Incandescent burners." Oct. 11.
23,133.—Horstmann, G. O. H., E. H., A., & S. A., and Edgar, W. T., "Pilot-lights for gas-burners." Oct. 11.
23,195.—Wakefield, C. C., "Acetylene generators." Oct. 11.
23,200.—Campbell, H. E., "Safety-attachments for gas-burners." Oct. 11.
23,299.—Parkinson and W. & B. Cowan, Limited, and Cheshire, W., "Torch-traps for street-lamps." Oct. 12.
23,338.—Duenkel, C. L., and Verges, H. A., "Meters." Oct. 12.
23,383.—Scott, W., "Meters." Oct. 13.
23,409.—Harrison, R., and Melmore, W. M., "Compressing air or gas." Oct. 13.
23,434.—Visseaux, J., "Mantles." Oct. 13.
23,476.—Tuckfield, C., and Garland, W. G. de F., "Gas-engine." Oct. 14.
23,482.—Aird, K., "Gas-fires." Oct. 14.
23,534.—Siemens, F. K., "Regenerative gas-furnaces." Oct. 14.
23,545.—Neue Kramerlicht G. m. b. H., "Regulators for burners." Oct. 14.
23,551.—Hibberd, C. E., "Gas-meters." Oct. 14.
23,614.—Mills, J., and Price, W. J. F., "Gas-engines." Oct. 15.
23,622.—Feeny, V. I., "Gas-governors." Oct. 15.
23,624.—Williams, P. E., "Treating coal and like gas for the removal of cyanogen." Oct. 15.
23,633.—Cooke, J. J., "Incandescent burners." Oct. 15.
23,665.—Arnold, H., "Incandescent lamps." Oct. 15.
23,671.—Muller, W., "Manufacture of coke and gas." Oct. 15.
23,678.—Blakey, J. W. & A. G., "Lighting intensified gas-lamps." Oct. 16.
23,727.—Lines, A. A., and Hassell, W., "Attaching globes." Oct. 16.
23,760.—Oligny, J. D., and the Peat Gas and Coal Company, "Peat-gas producing process." Oct. 16.
23,766.—Hugendick, W., "Continuous distillation of tar." Oct 16.
23,767.—Oligny, J. D., and the Peat Gas and Coal Company, "Peat-gas plants." Oct. 16.

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Artistically produced in Antique Copper in high class style, fitted with glass panels shown.

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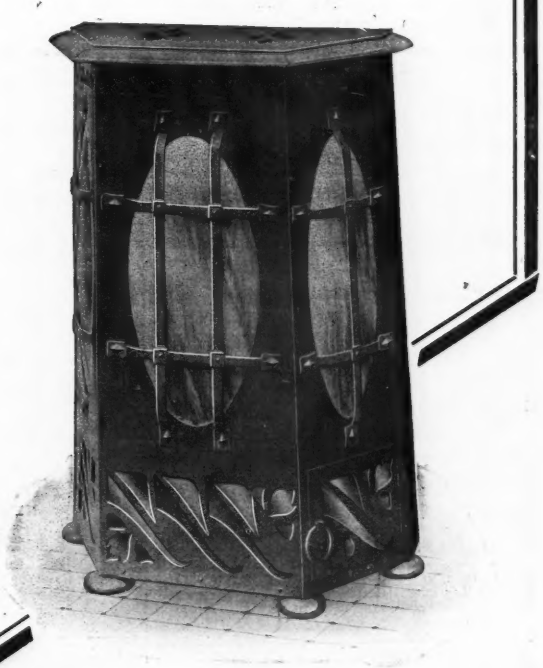

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Lewisham Public Lighting.—At the meeting of the Lewisham Borough Council last Wednesday, the Highways Committee reported that they had made a further application to the South Suburban Gas Company for a reduction in their charges for public lighting. A reply had been received from the Engineer of the Company (Mr. S. Y. Shoubridge) to the effect that his Board were anxious to meet the Council in the matter, and as there had been some saving in the cost of mantles, they were prepared to reduce their charges for the lamps as follows: Lamps with No. 2 burners, from £2 9s. 2d. to £2 7s. 8d.; lamps with No. 3 burners, from £2 16s. 11d. to £2 14s. 10d.; lamps with No. 4 burners, from £3 4s. 7d. to £3 1s. 11d.—all subject to 5 per cent. discount for cash monthly. These alterations will make a difference of £96 per annum, which, with the reduction made by the South Metropolitan Gas Company, reported in July last, makes a total saving to the Council of £205 19s. per annum.

Among the new Companies recently registered is that of Clark's Syphon Stove Company, Limited, with a capital of £3000, in £1 shares.

Mr. M'Rae, the Davis Gas-Stove Company's Advertising Manager at Luton, has been awarded a silver medal in connection with the "Best Press Advertisement Competition" at last week's Business Exhibition at Olympia. In the "Best Booklet Contest," also, his work was highly commended. On these results both Mr. M'Rae and the Davis Gas-Stove Company are to be congratulated.

Messrs. John Wright and Co. have been awarded a gold medal for their gas-heated steam radiator—The "St. Andrew"—by the Jury of the Imperial International Exhibition, 1909. They have also received a first diploma of merit for gas-steam radiators, open gas-fires, gas water-heaters, and gas-cookers from the promoters of the recent Smoke Abatement Exhibition at Sheffield.

In consequence of leakage from the gasholder tank at the Strabane Gas-Works, the Urban District Council have, on the recommendation of Mr. R. J. Skinner, the Engineer and Manager of the Londonderry Gas-Works, decided to requisition the services of a diver to ascertain what is wrong, and if possible repair the damage. It was stated that, in the event of the efforts of the diver proving fruitless, a new gasholder would have to be erected, or else the town would have to do without light while the present one was being repaired, which would occupy perhaps a month or two.

In the new season's gas-fire list (No. 246) which Messrs. Fletcher, Russell, and Co., Limited, are sending out, and in the supplement to it are shown several new and original designs. Attention may be particularly called to the "Madeira" and "Aden" fires and the "Ariel" radiators which were illustrated in the "JOURNAL" a few weeks ago. The firm make a special point of their Majolica and Chimatto enamel finishes for fires and heating-stoves. Accompanying the list, which contains a great variety of appliances, all effectively shown, is the new season's fire pamphlet, as well as an illustration and particulars of the automatic instantaneous water-heater.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

JUNIOR DRAUGHTSMAN. No. 5147.
WORKS FOREMAN. Sunderland Gas Company.
ENGINE FITTER, &c. Devonport Gas Department. Applications by Nov. 15.

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SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.
AUTOMATIC METER COLLECTOR. 164, Robertson Street, Battersea.

Plant, &c. (Second-Hand), for Sale.

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EXHAUSTER, CONDENSERS, TANK, WASHERS, PURIFIERS, COAL BREAKER AND ELEVATOR. Walker and Wallsend Gas Company.
PURIFIER COVERS AND HURDLE GRIDS, &c. Wantage Gas-Works.

Patent Licence.

METER INDEX AND COMPUTING DEVICE. G. J. Cox, Melbourne.

Stocks and Shares.

BARKING GAS COMPANY. Nov. 2.
HERTS AND ESSEX WATER COMPANY. Nov. 2.
REDHILL GAS COMPANY. Nov. 1.
SOUTHEND GAS COMPANY. Nov. 16.
TENDRING HUNDRED WATER COMPANY. Nov. 16.
WEST KENT GAS COMPANY. Nov. 2.

TENDERS FOR

Coal Store, Weigh Office, Tar-Tanks, Apparatus, &c.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL. Tenders by Nov. 1.

Exhausting Plant, &c.

CLEATOR MOOR GAS DEPARTMENT. Tenders by Nov. 19.

Fire-Clay Goods.

LLANDUDNO GAS DEPARTMENT. Tenders by Oct. 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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"VOLCANIC" FIRE CEMENT.
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The one Machine which Discharges and Charges at One Stroke.
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MR. W. B. MIMMACK, for many years Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
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WANTED, as soon as possible, a JUNIOR DRAUGHTSMAN, accustomed to Constructional Steel and Gas Plant work, for a Gas-Works in the County of Durham. Salary 30s. per Week to commence.
Apply, by letter, stating Age and Experience, enclosing *copies* of not more than Three Testimonials, to No. 5147, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

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WANTED, a thoroughly Trained and Experienced ENGINE-FITTER, who will act as WORKING MECHANIC in Charge of Machinery. Preference will be given to One who has a special knowledge of Hydraulics. Wages, £2 per week, with House on the Works, Coals, Gas, and Rates Free.
Applications, in writing only, stating Training, Experience, present Employment, Age (from 30 to 40 Years), and if Married, endorsed "Fitter," addressed to the Engineer, Gas-Works, on or before Nov. 15, 1909.

WANTED, a Works Foreman for the Ayres Quay Works of the Sunderland Gas Company to take Day and Night Duty on Alternate Weeks.
He must have had a practical Experience of the Work connected with the entire process of Gas Manufacture, and be able to Undertake the Supervision of all the Plant in an up-to-date Works. A working knowledge of Electrical Machinery desirable. Wages, 44s. per week.
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Address, Gordon Walker, Manager and Secretary, Gas-Works, Wantage.

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THE Directors of the above Company have FOR SALE a Second-Hand Two-Bladed Gwynne and Beale's 40,000 Cubic Feet per Hour (at 70 Revolutions per Minute) GAS EXHAUSTER, without Engine, but with Belt Pulley 3 feet diameter, 6 inches wide, also 12-inch diameter Screw Down Inlet and Outlet Disc Valves.
Further Particulars may be obtained from the undersigned, to whom Offers should be made.
J. D. Ashworth, M.Inst.M.E.,
Engineer and General Manager.
Engineer and General Manager's Office,
Flathouse Gas-Works,
Portsmouth, Oct. 11, 1909.

FOR SALE—the following Second-Hand GAS-PLANT—
One Bryan Donkin EXHAUSTER, combined on One Bedplate with Horizontal Steam-Engine, complete with Inlet and Outlet Valves. Capacity, 30,000 Cubic Feet of Gas per Hour.
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One CAST-IRON TANK, 18 ft. 4 in. by 14 ft. by 5 ft. deep, Machine Faced Joints, Plates ½-inch thick.
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One COAL BREAKER and ELEVATOR capable of handling 20 Tons of Coal per Hour.
Apply to the Walker and Wallsend Union Gas Company, Neptune Road, Wallsend-on-Tyne.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.
GAS-WORKS EXTENSION.
PERSONS desirous of Tendering for the Construction of ENTRANCE GATES, WEIGH OFFICE, COAL-STORE, TAR-TANKS, APPARATUS, BUILDINGS, ROADS, &c., in connection with the above, are requested to send their names and addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street Westminster, S.W., not later than Monday, the 1st day of November, 1909, together with a deposit of £3 3s. (cheques only), for *copies* of Specification, Bill of Quantities, and Form of Tender. The deposit will be returned on receipt of a *bond-fide* Tender.
The Drawings of the proposed Works can be inspected at the Offices of the Surveyor to the Council, Outram Street, Sutton-in-Ashfield.
The lowest or any Tender will not necessarily be accepted.
John D. Fidler,
Clerk to the Council.
Council Offices,
Sutton-in-Ashfield.

CLEATOR MOOR URBAN DISTRICT COUNCIL.

TENDERS are invited by the above Council for the work of DUPLICATING the EXHAUSTING PLANT at their Gas-Works on a new site.

A copy of the Drawings and Specifications may be obtained from the undersigned on payment of £1 1s., which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Exhauster," and addressed to the undersigned, to be delivered, at the Public Offices, Cleator Moor, not later than Friday, the 19th day of November, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

HENRY ROTHERY,
Clerk to the Council.

Public Offices, Cleator Moor,
Oct. 19, 1909.

THE Llandudno Urban District Council invite TENDERS for the Supply of RETORTS and other FIRE-CLAY GOODS, &c., delivered free at Llandudno.

Full Particulars may be obtained upon Application to the Gas Manager.

Sealed Tenders, endorsed "Retorts," to be sent in to the undersigned on or before Saturday, the 30th of October, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) ALFRED CONOLLY,
Clerk to the Council.

Town Hall, Llandudno,
Oct. 12, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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NEW ISSUE OF 500 £10 ORDINARY SHARES
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£1000 FOUR PER CENT. MORTGAGE DEBENTURES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 2, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of he Directors of the
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25 £10 FULLY-PAID ORIGINAL SHARES.

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By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £21,500 NEW ORDINARY "B" STOCK
AND
£3500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in Lots.

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By order of the Directors of the
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REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER £3500 of ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Monday, the 1st of November, 1909, at Twelve o'clock at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Brighton Road, Redhill.

By order of the Directors,
HORACE LONG,
Secretary.

Redhill, Surrey,
Sept. 30, 1909.

TO INDEX MAKERS AND OTHERS.

THE Advertiser is desirous of treating with Index Makers, or with others interested, for the Assignment of such Rights as he may Possess to obtain British and other Patent Rights under International Convention Rules, for the INDEX and COMPUTING DEVICE COMBINATION, described in connection with consumers' accounts, &c., in last week's issue of the "JOURNAL," preferably on a Royalty basis. Advertiser considers the Device referred to would be a useful novelty, attractive and popular, and that, if retailed at a reasonable price, would command Handsome Sales among Gas Consumers generally. A copy of a Patent Specification and Drawings, as deposited in the Australian Commonwealth Patent Office, Melbourne (as the basis of Subsequent applications elsewhere), can be inspected at 50, Devonshire Road, Chiswick, W.

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Above the Average in Weight and Quality of Coke.
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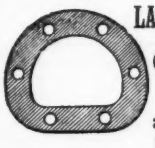

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SPECIAL BRICKS & BLOCKS of every description for GENERATOR and REGENERATOR FURNACES.

Large Stocks of Bricks of all sizes, Burrs, Boiler Seating Blocks and Covers, Plain and Rebated Tiles, &c., &c.

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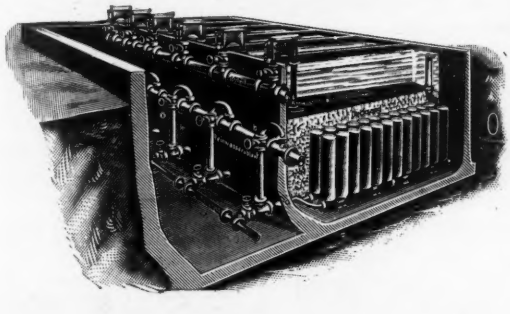

WATER FOR DRINKING AND INDUSTRIAL PURPOSES
AS CLEAR AS CRYSTAL
Supplied from turbid rivers and ferruginous underground water to isolated buildings, by means of the
PATENT AGGA COMPOUND FILTER.
Lowest expenses for attendance and working.
AKTIEN-GESELLSCHAFT FÜR GROSSFILTERATION U. APPARATEBAU,
WORMS-ON-RHINE.

The Inverted Burner has met with great success, but it has by no means

KILLED the **UPRIGHT.**

THE

LUCAS LIGHT'S LONG LIFE

is proof of this.

OUTDOOR.

The Lucas Light was the first and original self-intensive high-power lamp, and **its steady sale to-day proves its value.**

200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

No high pressure required.

SIMPLE. BRILLIANT. RELIABLE.

The "Lucas" is the best lamp for Public Halls, Factories, Workshops, Streets, Railway Stations, &c., and the prices compare favourably with those of any similar type of lamp.

MOFFAT'S LTD.,

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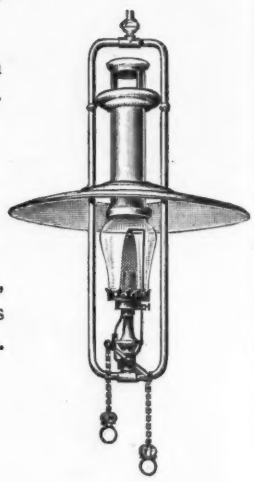

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Dortmund 5. (GERMANY).

Chamber-Furnaces

HORIZONTAL, VERTICAL, INCLINED

FOR GAS AND COKE

SO FAR 97 CHAMBERS BUILT AND BUILDING FOR A DAILY PRODUCTION OF

4 322 500 C.Feet.

IN POINT OF EFFICIENCY, COST OF PRODUCTION AND RESULTS

BEST FURNACES IN THE WORLD.

2000 WORKMEN.

ENQUIRIES AT ONCE ATTENDED TO.

CAST-IRON PIPES FOR GAS, WATER, & STEAM,

also VALVES of all descriptions.

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ALLIANCE FOUNDRY, 147, MILTON STREET, **GLASGOW,**
And LAMBHILL FOUNDRY, **GLASGOW.**
OFFICE: 147, MILTON STREET, **GLASGOW.**

THE WIGAN COAL & IRON CO., LIMTD.,

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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GRAETZIN LIGHT

Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

From Lamps with more than one burner, the bunsens can be removed from the outside, without taking the lamps to pieces.

ASHMORE, BENSON, PEASE & CO., LTD.,

STOCKTON-ON-TEES.

Telegrams: "GASHOLDER."

MANUFACTURERS AND ERECTORS OF

Gasholders, Purifiers, Condensers, Washers, Steel Mains, Roofs,

AND ALL OTHER GAS-WORKS PLANT.

The Name of

MOBBERLEY & PERRY, STOURBRIDGE,

LIMITED,

on Gas Retorts and Fire-Clay Goods

is a

GUARANTEE OF BEST STOURBRIDGE QUALITY.

GEO. R. LOVE'S

INCLINES AT 45 DEGREES.

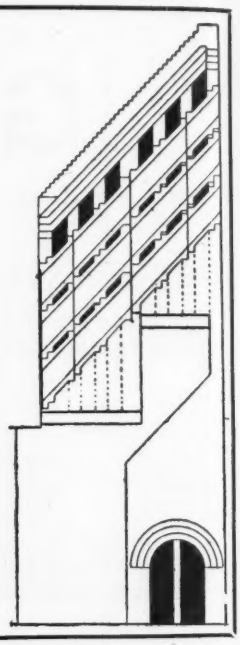
CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.
No **Machinery** to get out of order.
Carbonizing charges **40 per cent. less** than with Horizontals.
No skilled Stokers necessary.
Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.
Saleable value of Coke greatly increased.
25 per cent. greater yield of Ammonia.
More liquid Tar.
Stopped Pipes unknown.

Naphthalene always in solution.
45 per cent. less ground space required.
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.
Several Installations in course of construction or completed.



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Specialities:
TRANSMISSION OF POWER.
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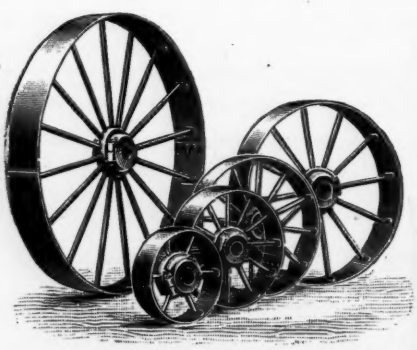

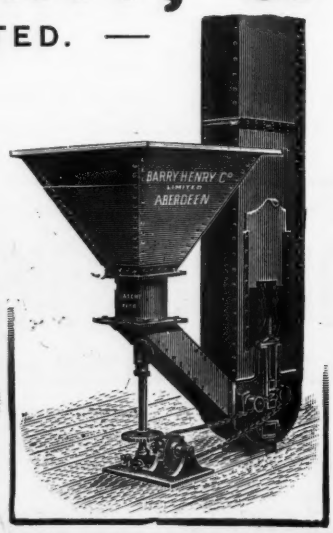

Specialities:
TRANSMISSION OF MATERIALS.
Conveyors,
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Motors.

AND
64, MARK LANE,
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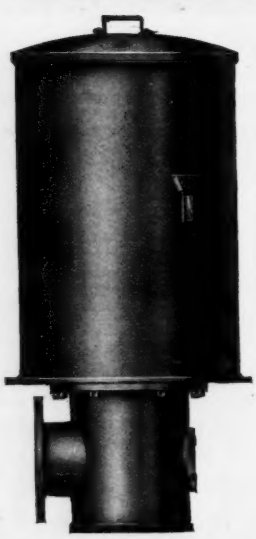

RETORT HOUSE GOVERNORS.

THESE Governors are made to prevent fluctuation in the Pressure of Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.

JAMES MILNE & SON, LIMITED,

EDINBURGH, LONDON. GLASGOW. LEEDS.

Rheinische Chamotte-und Dinas-Werke, Cologne on Rhine.

Construction of

Entire Gas-Works & Coke Oven Plants,

Retort Furnaces,

Furnaces for Chamber Settings (*Patent*), New Coke Ovens (*Patent*),

With and without Recovery of the Bye-Products, Tar and Benzol Distilleries, Ammonia Works, and Cyanogen Extraction Plants.

BIGGS, WALL & CO.

Telegrams: "RAGOUT LONDON."
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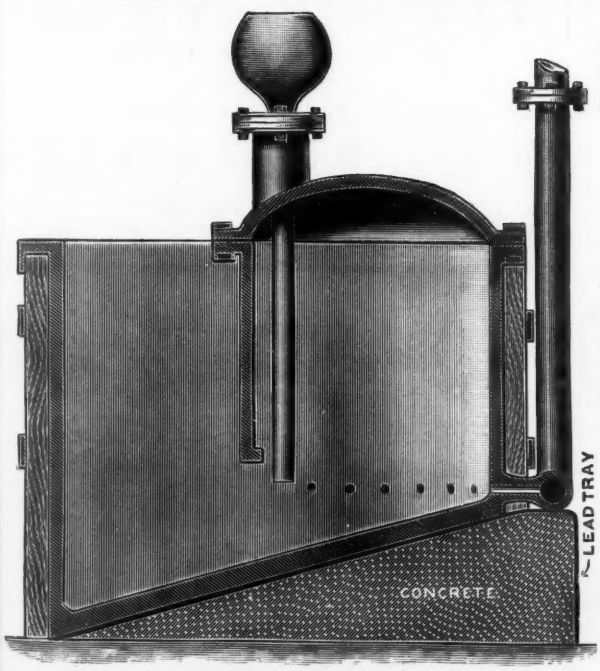
MAKERS OF **SULPHATE OF AMMONIA PLANT.**



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Sole Proprietors of Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, for which we claim the following

ADVANTAGES:—

1. **Equal distribution of Steam and Ammonia.**
2. **Perfect agitation and boiling of the Acid Liquor.**
3. **No possibility of local Alkalinity,**
4. **Consequently no formation of Blue Salt.**
5. **Sulphate is easily forced to point of discharge.**
6. **No incrustation.**
7. **No renewals of Cracker Pipe.**
8. **Capacity of output greatly increased.**

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED;
FOR FULL PARTICULARS APPLY TO

BIGGS, WALL & CO.

13, Cross Street, Finsbury Pavement,
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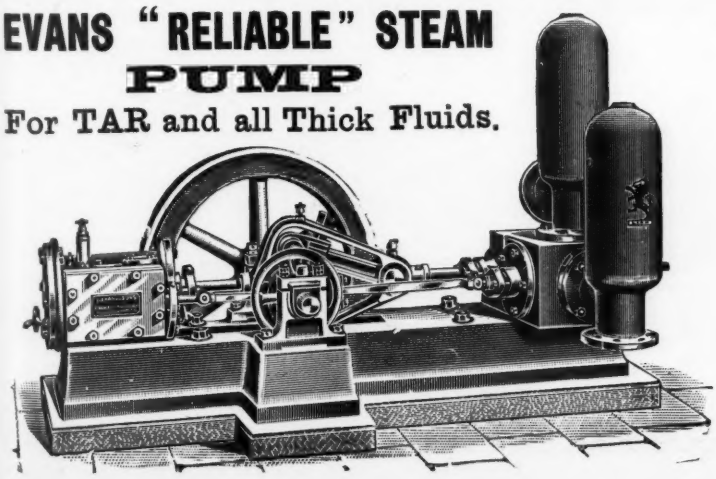
EVANS "RELIABLE" STEAM PUMP

For TAR and all Thick Fluids.



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Write for No. 8 Catalogue.

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JOSEPH EVANS & SONS,

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CULWELL WORKS,
WOLVERHAMPTON.

MAIN LAYING.

Paper by PERCY GRIFFITH, M.Inst.C.E., and BRUCE McGREGOR GRAY, Assoc.M.Inst.C.E., before the Association of Water Engineers.

A. The Authors used *Flanged Pipes* for the Rising Main up the Steep side of the Barff, and their experience proved that this was not an advantage, as *the rigidity of the Joints involved considerable difficulty* in regard to the depth of the Trench, and a good deal of Cutting to make the final Connections at each end of the Pipe-Line.

B. In the case of the Delivery Main, the Joints were *Ordinary Socket Joints*, but made with Lead only. The only difficulty met with here was the necessity for *pouring the Lead in* at a suitable temperature *to prevent it melting the Solid Lead Fillet*, and *running through into the Pipe.*

C. In some of the Smaller Branch Connections, Lead Wool was used, and proved highly successful.

Particulars from

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

"COALEXLD."

The growing popularity of the Manufacture of Coalexld is **proved** by the absence of Stocks of Coke, and the **increased** number of Gas-Works now making it.

COALEXLD LIMITED,
LANCASTER.

EVERITT'S Patent
TAR-FOG EXTRACTOR
AND
NAPHTHALENE REMOVER.

SOLE MAKERS:
ROBERT DEMPSTER & SONS,
ROSE MOUNT IRON-WORKS, *LTD.*,
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ARROL-FOULIS
Stoking Machinery
HYDRAULIC COKE PUSHERS
(HUNTER and BARNETT'S PATENT).
WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Oct. 19, p. 154.]

R. LAIDLAW & SON (EDINBURGH), LTD.
GAS METER MAKERS.

DRY METERS
IN
TIN AND IRON CASES.

WET METERS
IN
TIN AND IRON CASES
WITH ORDINARY AND
COMPENSATING DRUMS.

All Materials used in the Manufacture of these Meters are of the best quality, and the Workmanship of the Highest Standard.

SIMON SQUARE WORKS,
EDINBURGH.
8, LITTLE BUSH LANE,
LONDON, E.C.

Welsbach
LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

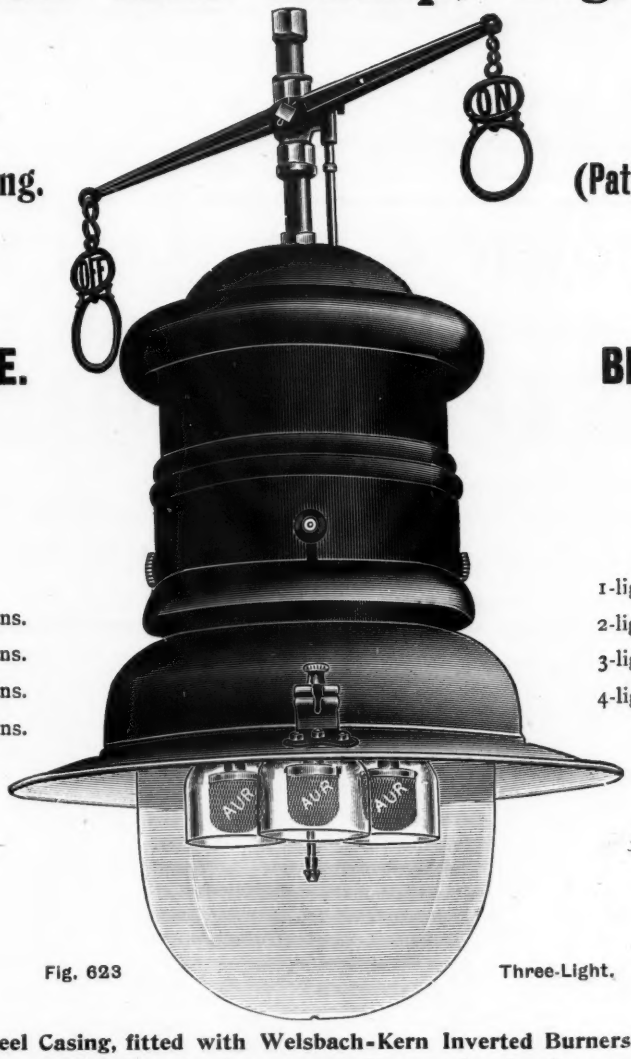


Fig. 623 Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

		1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each		**2/3**	**5/9**	**5/9**	**9/-**
" " "	In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .		*80*	*18*	*18*	*12*

		1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra	each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra	"	**3/6**	**6/-**	**7/6**	Not made

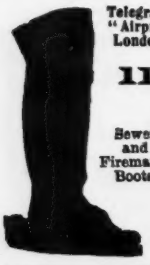
Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD..

Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON." *Telephone* 2410 NORTH.



Telegrams: "Airproof, London."

THOMAS BUGDEN & CO.,

Telephone: 743 City.

India-Rubber and Airproof Manufacturers and General Contractors,

116-118, GOSWELL ROAD, LONDON, E.C.

Largest Manufacturers of Gas Main Bags.

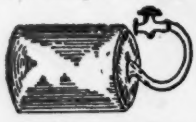
Sewer and Fireman's Boots.

Gas Bags for repairing Mains. All Seams Stitched and Taped.

Patentees of the DENMAR BAG,

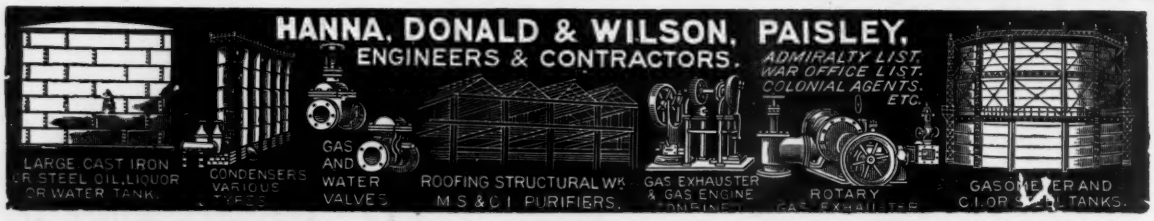
Impervious to Main Liquor and Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.



Gas Bags for repairing Mains. All Seams Stitched and Taped.

Contractors' and Mine Jackets.



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Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

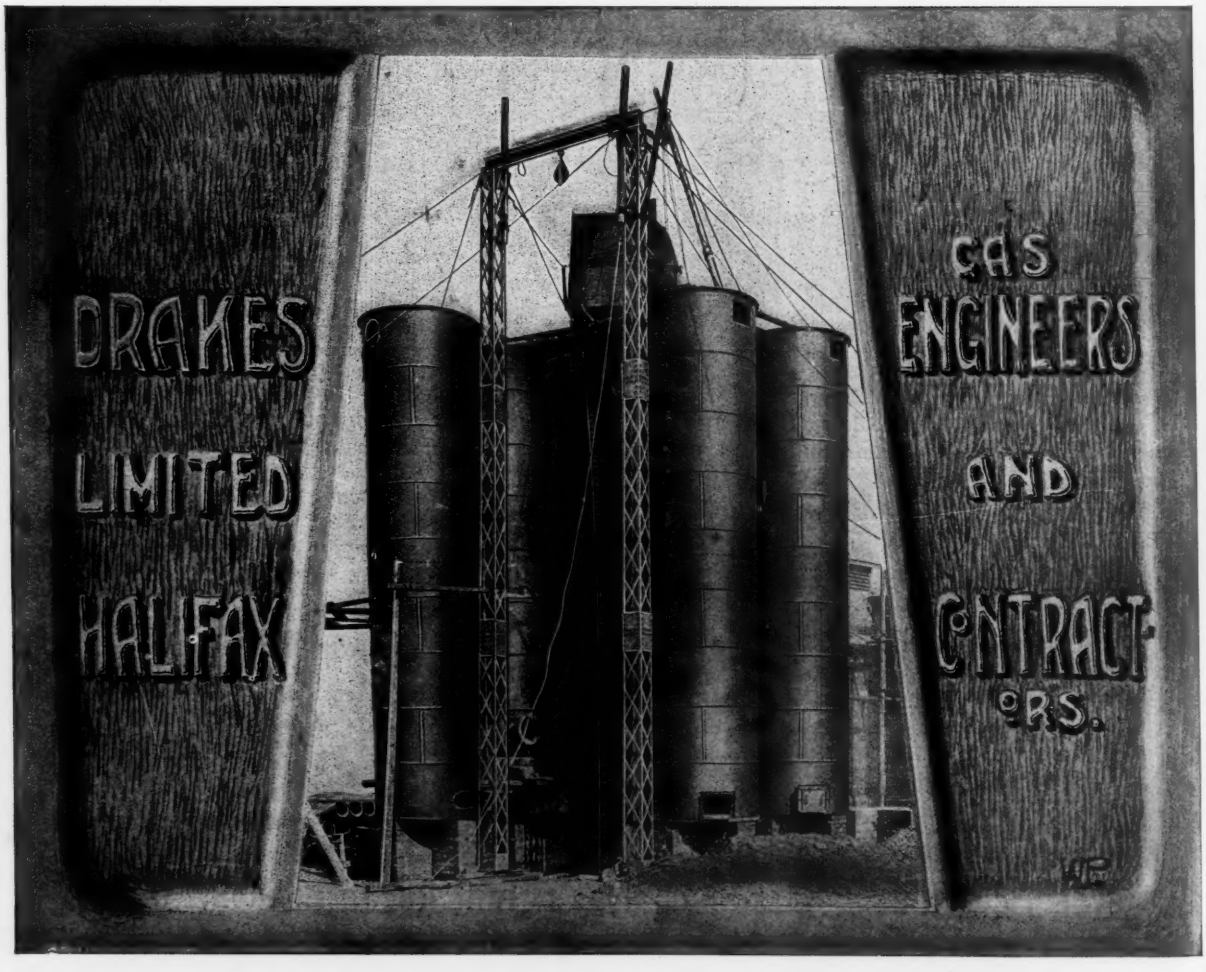
ALDWARKE MAIN GAS COAL

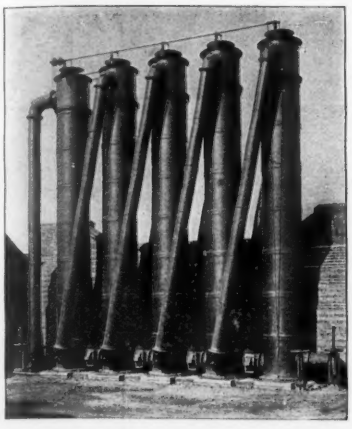
Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS SHEFFIELD."





GASHOLDERS.

WITH GUIDE FRAMING OR COLUMNLESS.

LUTED PURIFIERS LUTELESS

WATER **Condensers** AIR

GAS PLANT OF EVERY DESCRIPTION
DESIGNED AND ERECTED.

C. & W. WALKER, LTD., MIDLAND IRON WORKS, DONNINGTON, SALOP. 110, CANNON STREET, LONDON, E.C.

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CARBURETTED WATER-GAS PLANT.

MAXIMUM EFFICIENCY GUARANTEED.

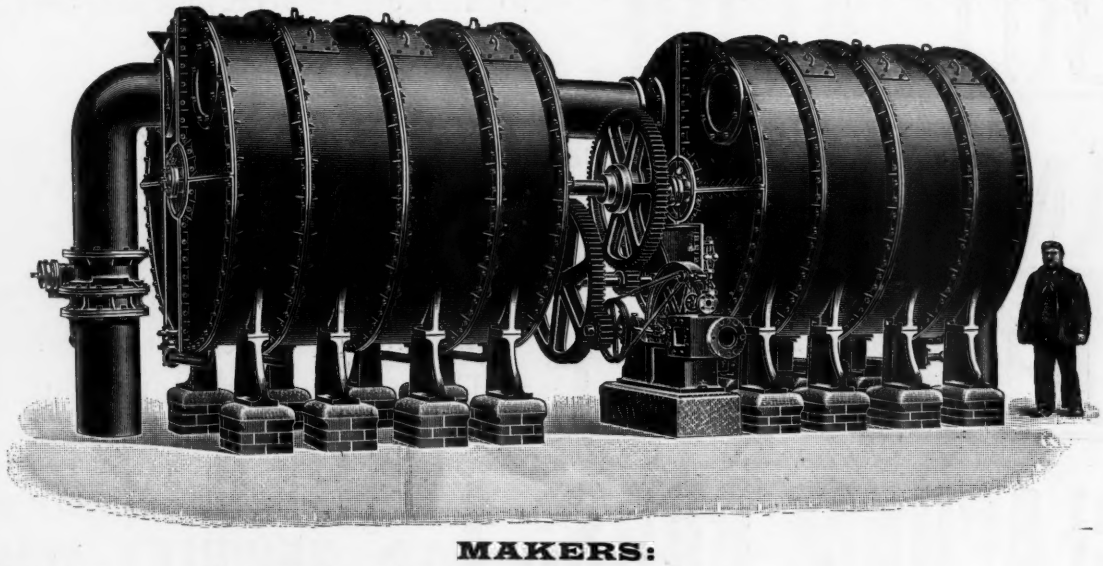
Inspection of Working Plants Invited.

No. 227.

ROTARY WASHER SCRUBBER.

Capacity **2,500,000** cubic feet per day,

For Gas-Works, **KINGSTON-ON-THAMES.** H. W. Packham, Esq., Engineer.



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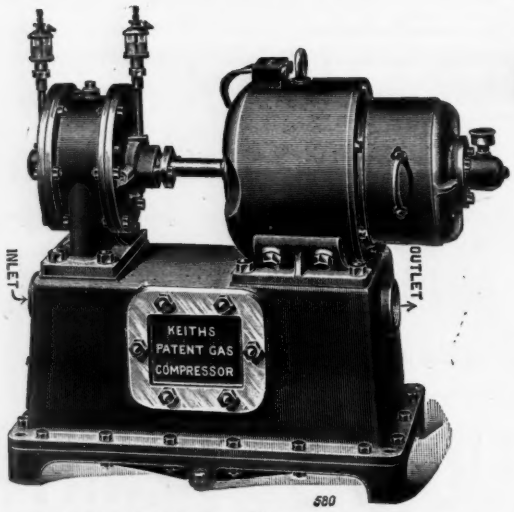
MANCHESTER.

The KEITH LIGHT.

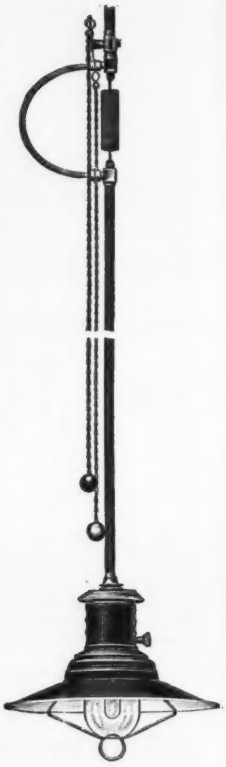
5500 Installations in use.



Electrically-driven Rotary Compressor.

60-CANDLE POWER PER FOOT.

Sizes from **100** c.p. to **1500** c.p.



100 to 300 c.p. Fitting.

JAMES KEITH & BLACKMAN Co., Ltd.

27, FARRINGDON AVENUE, LONDON, E.C.

WE ARE OLD makers of Gas-Works Plant, having been in business over Seventy Years,

BUT ALIVE to modern developments and requirements,

AND if you are requiring Retort Mountings, Condensers, Rotary Washers, Tar Extractors, Purifiers, or Valves, please send for our

UP-TO-DATE particulars of Clapham's "Eclipse" Specialities, which were awarded "Diploma of Honour" at the Franco-British Exhibition.

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Printed and Published by Walter King, at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 26, 1909.